

2021 ACCESSORIES AND BODY, CAB

Amplifier (AMP) - DTCS B1460-11 To B14B9-13 - Gladiator

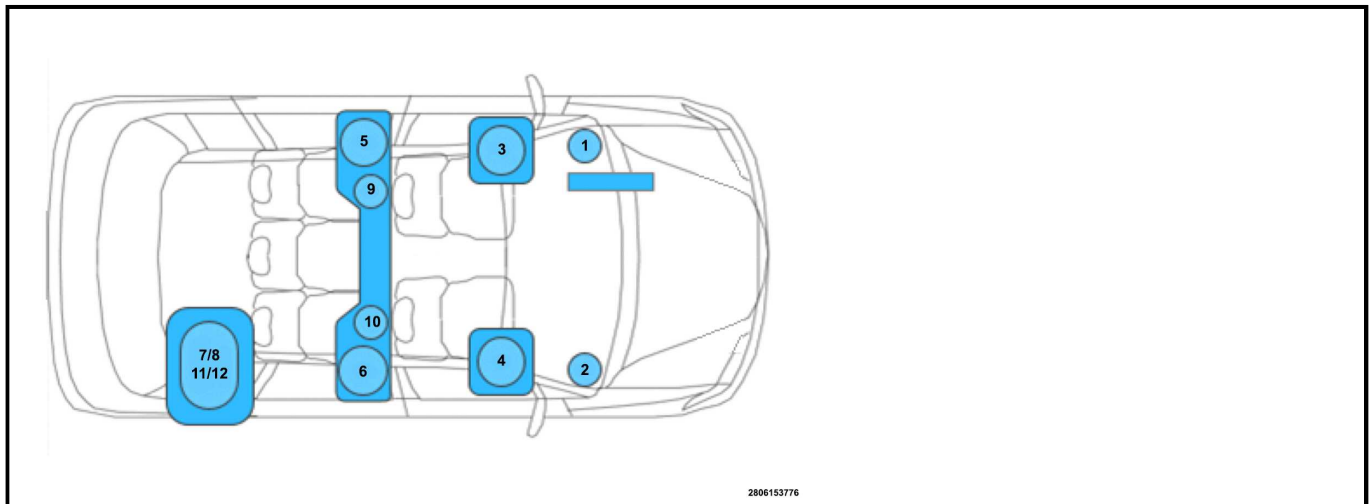
DTC TROUBLESHOOTING

B1460-11-CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

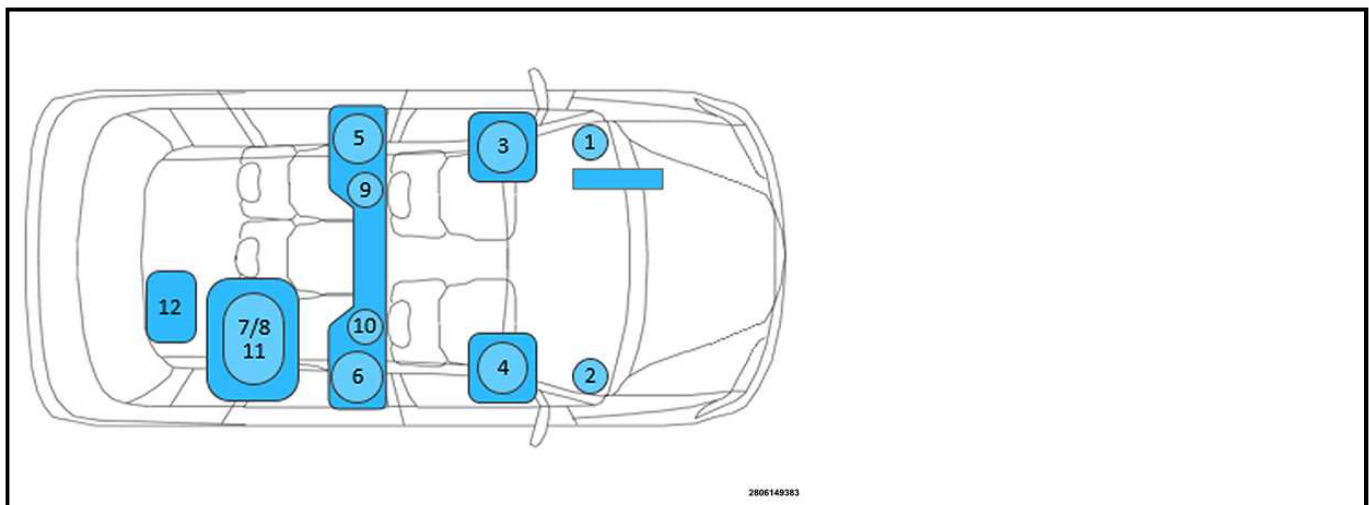
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X209	(+)
X299	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

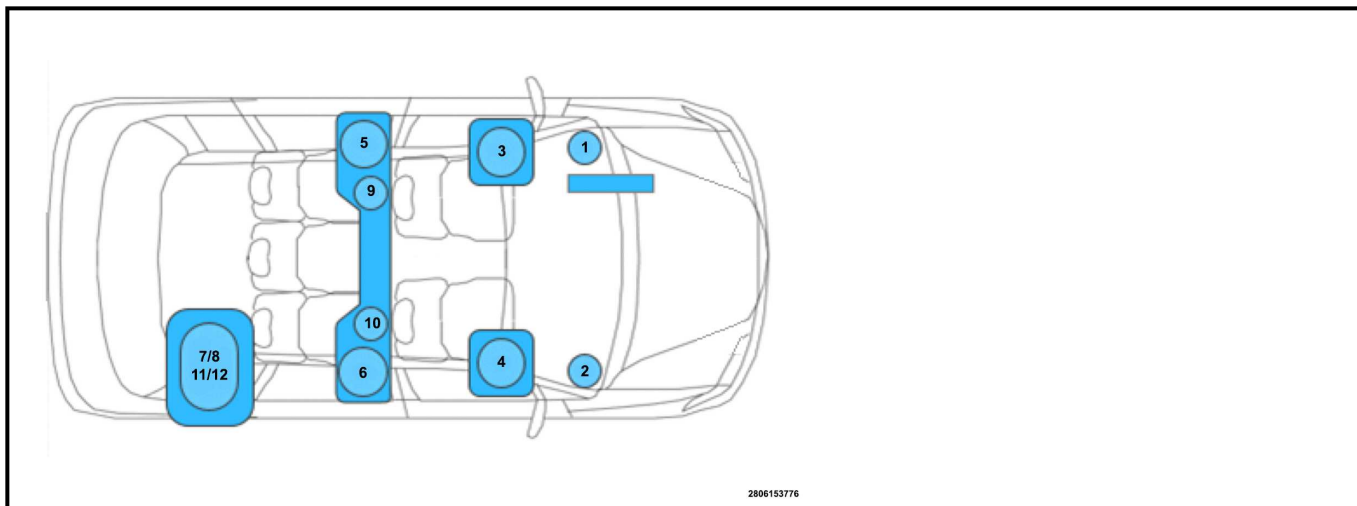
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1460-12-CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

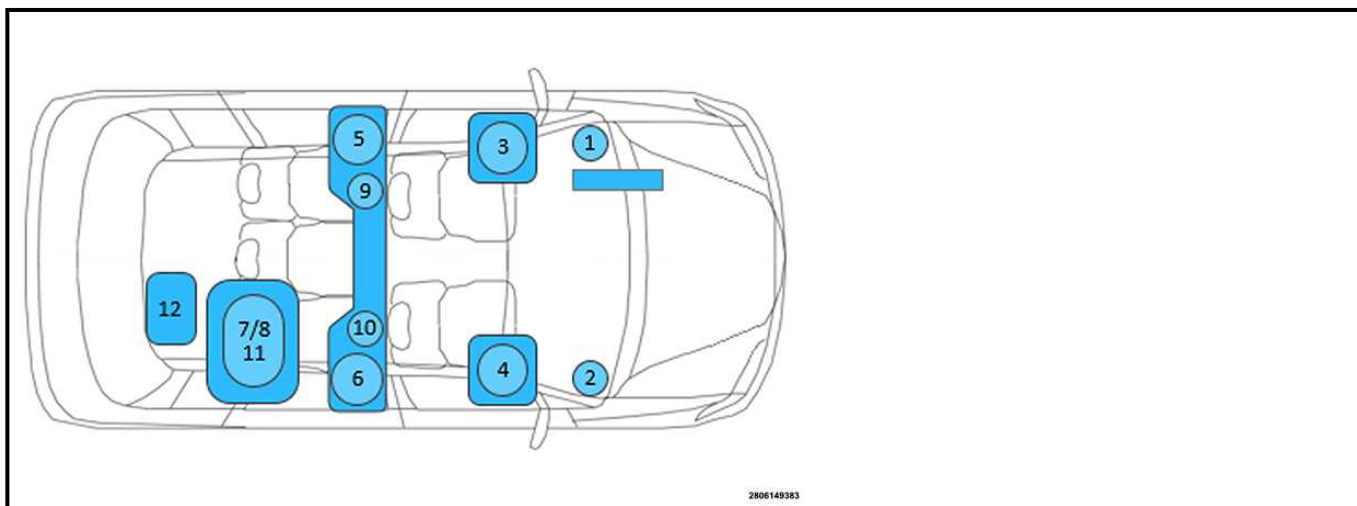
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X209	(+)
X299	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

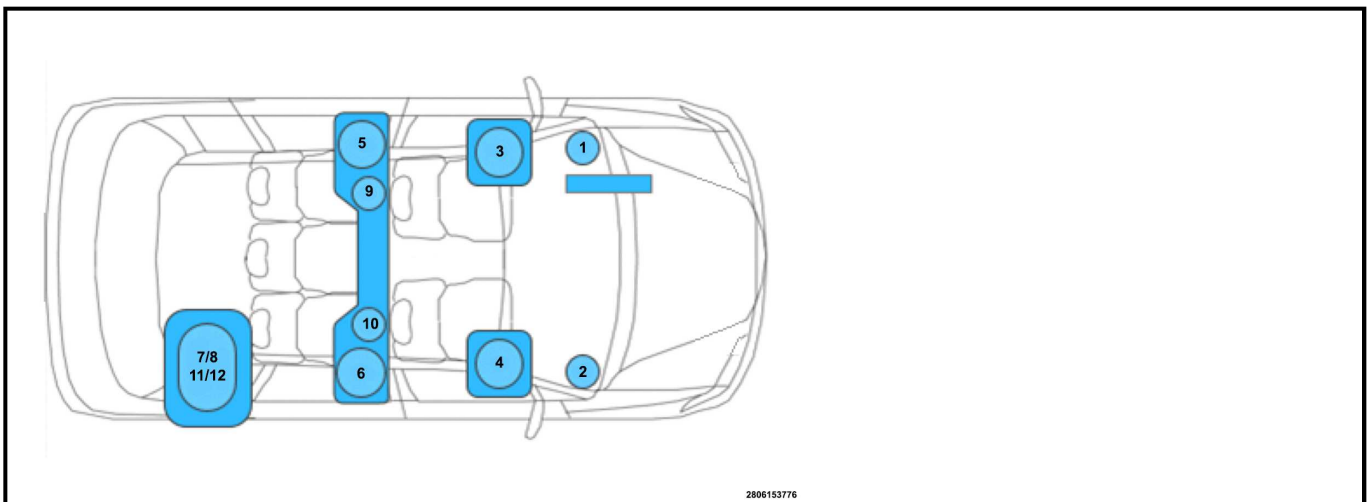
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1460-13-CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

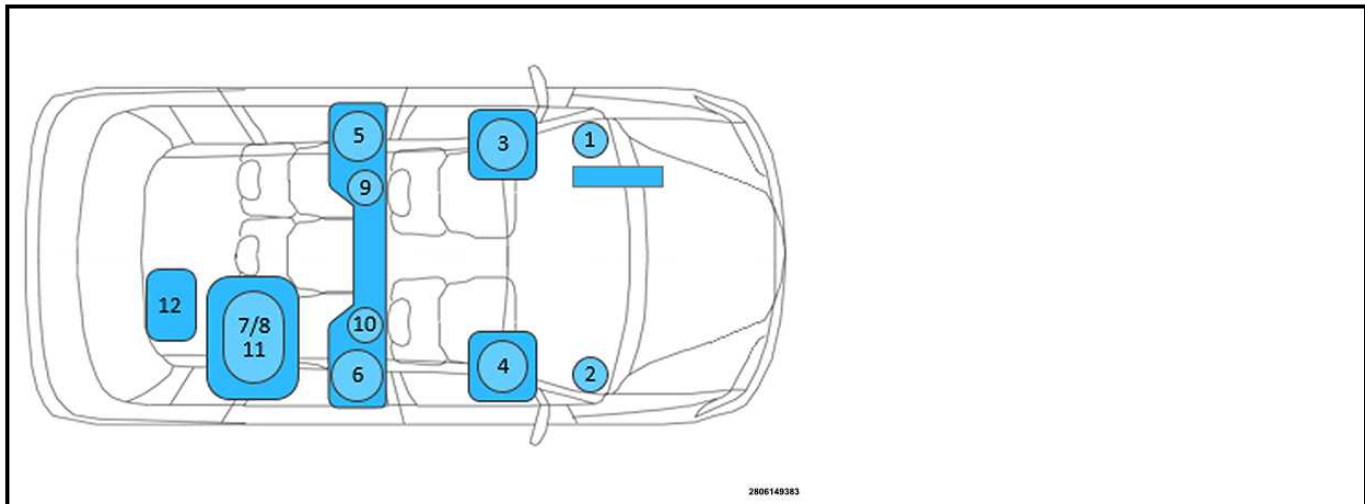
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information .**

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X209	(+)
X299	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any**

possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

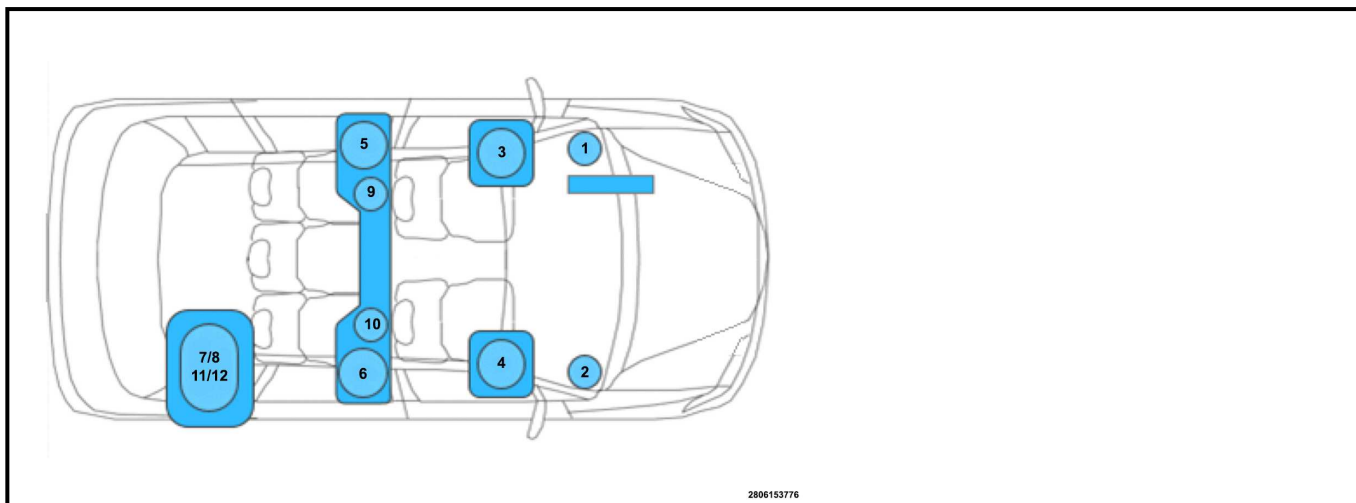
B1460-92-CHANNEL 1 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

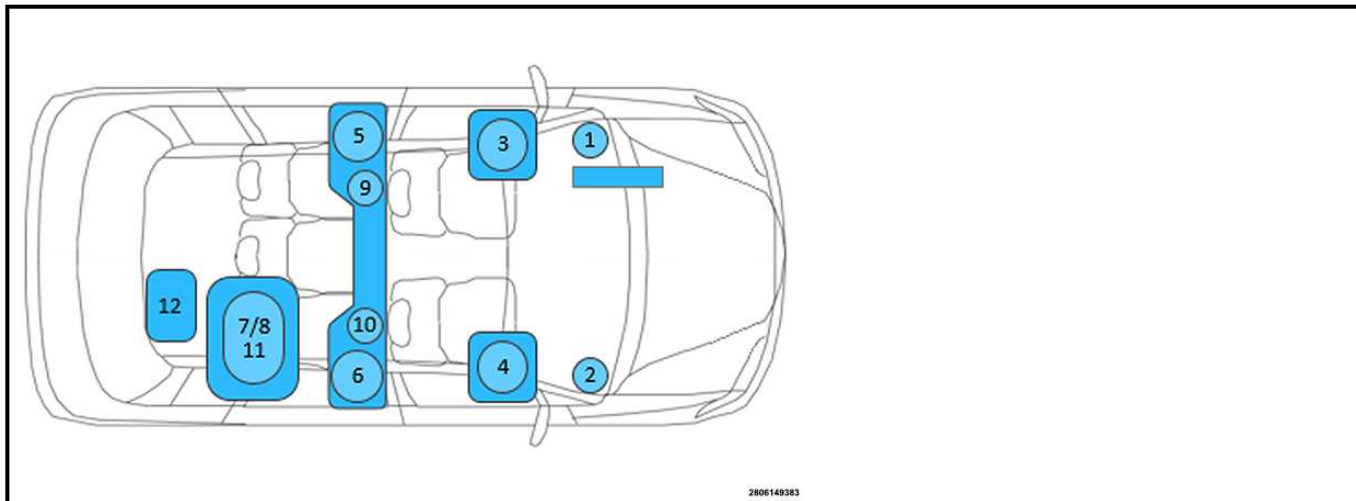
NOTE:

Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12

SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

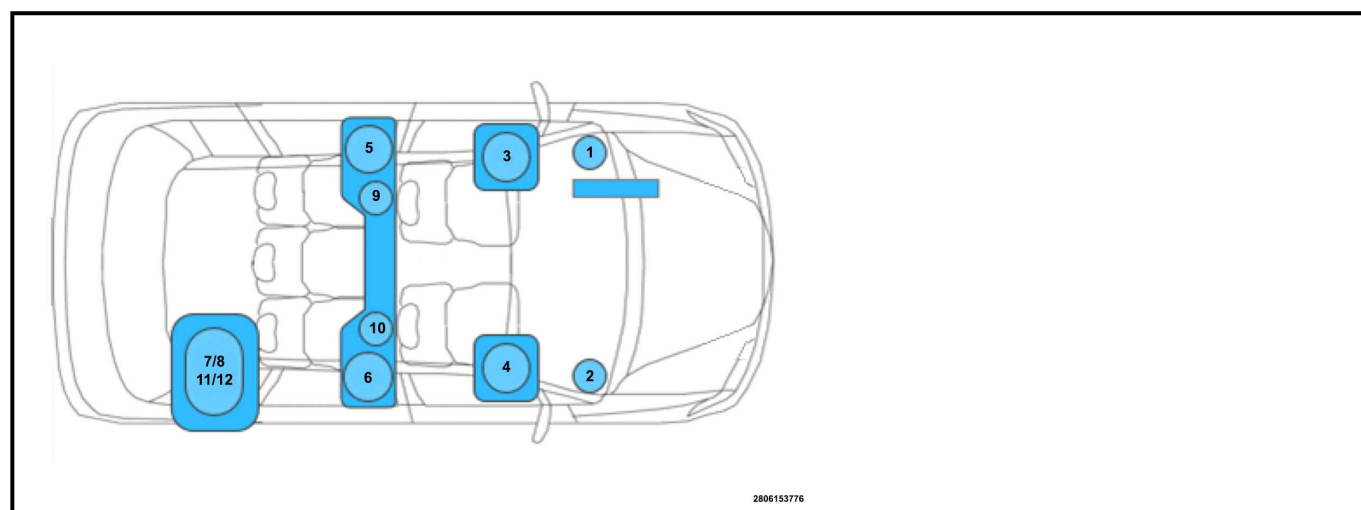
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B1464-00-CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

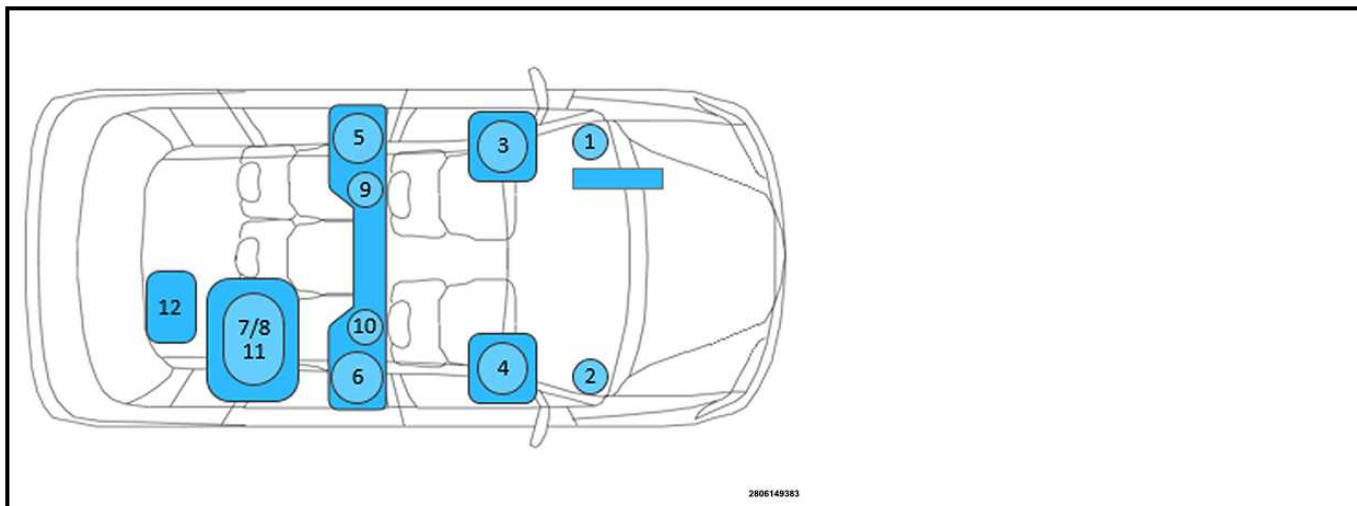
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X209	(+)
X299	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

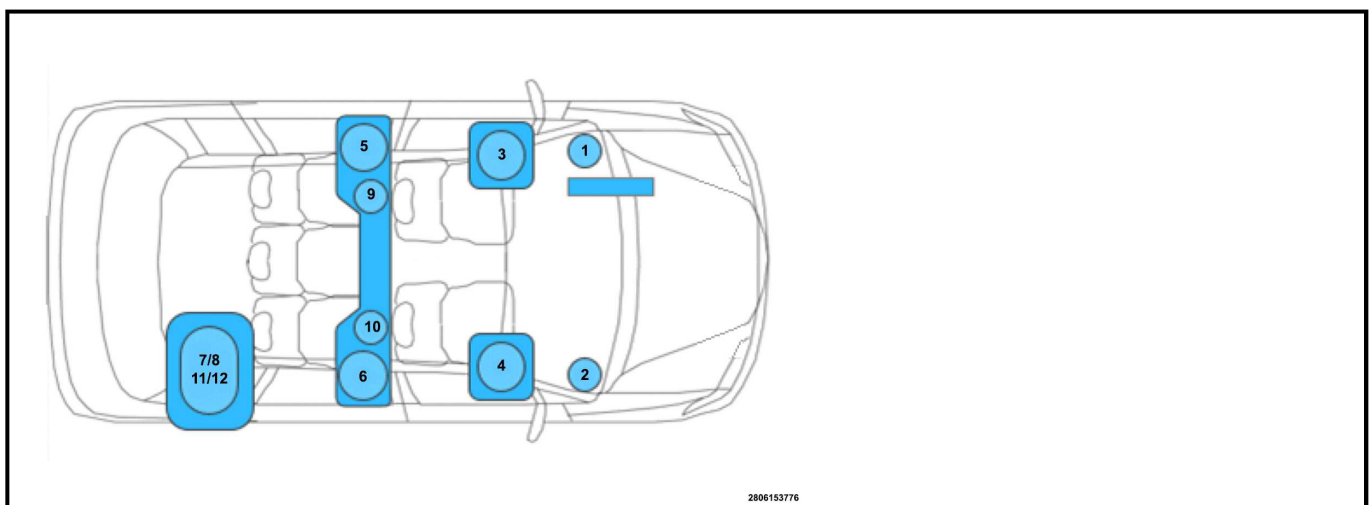
B1465-11-CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

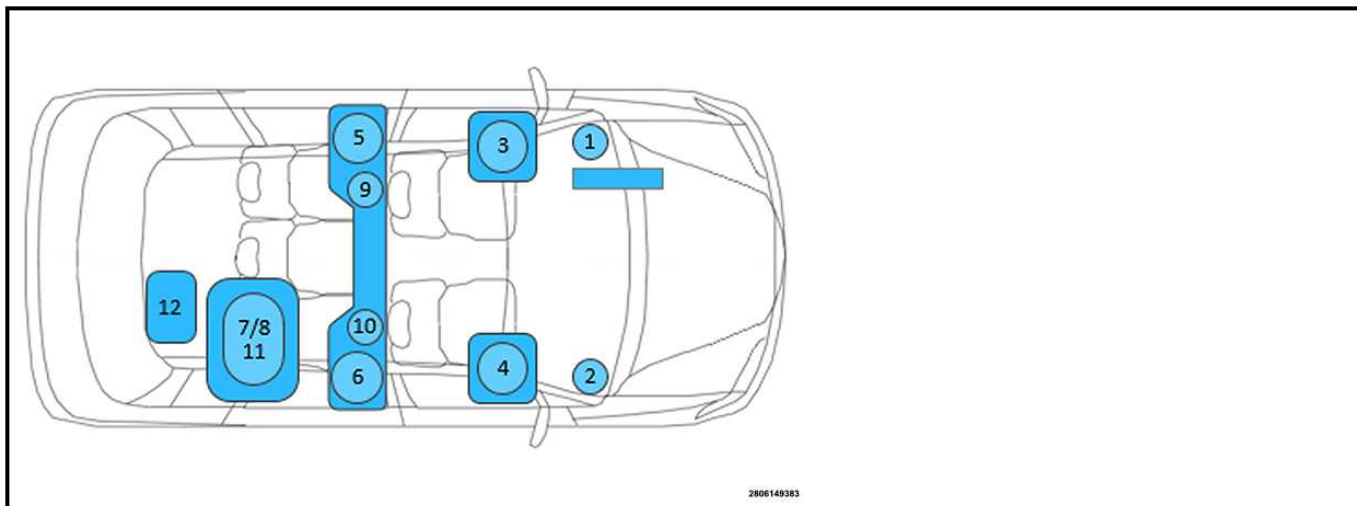
AUDIO CHANNEL MAPPING

NOTE:

Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X208	(+)
X298	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

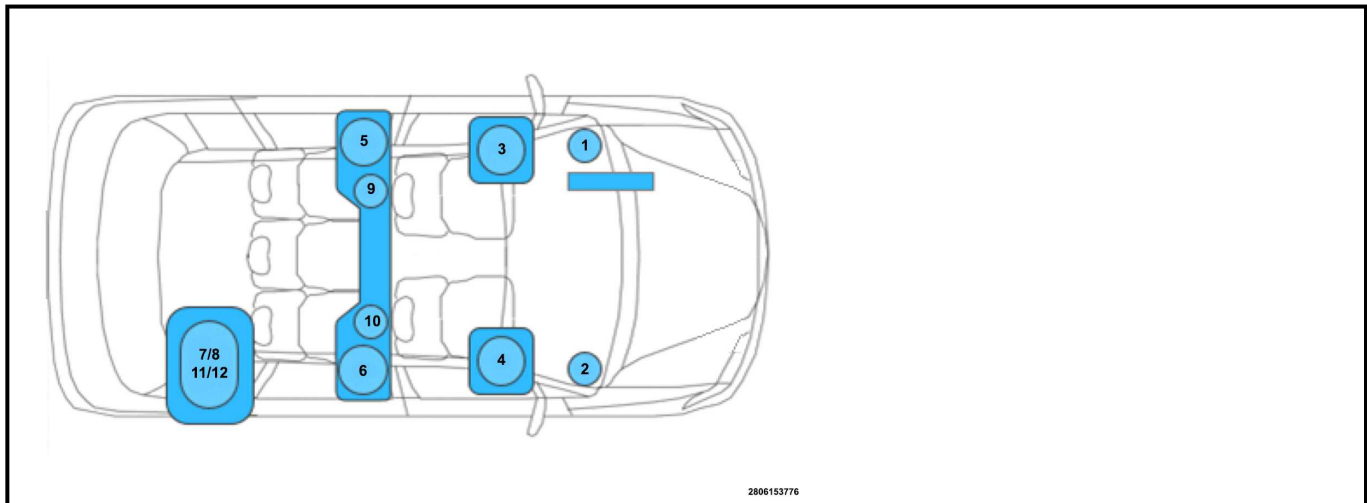
B1465-12-CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

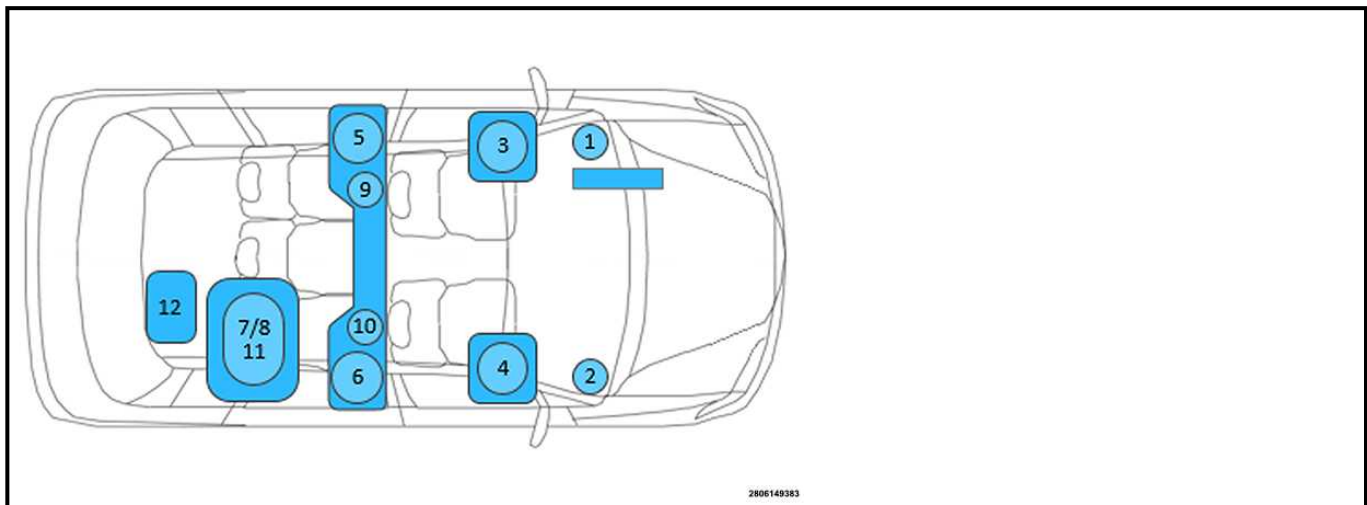
AUDIO CHANNEL MAPPING

NOTE:

Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X208	(+)
X298	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.

4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

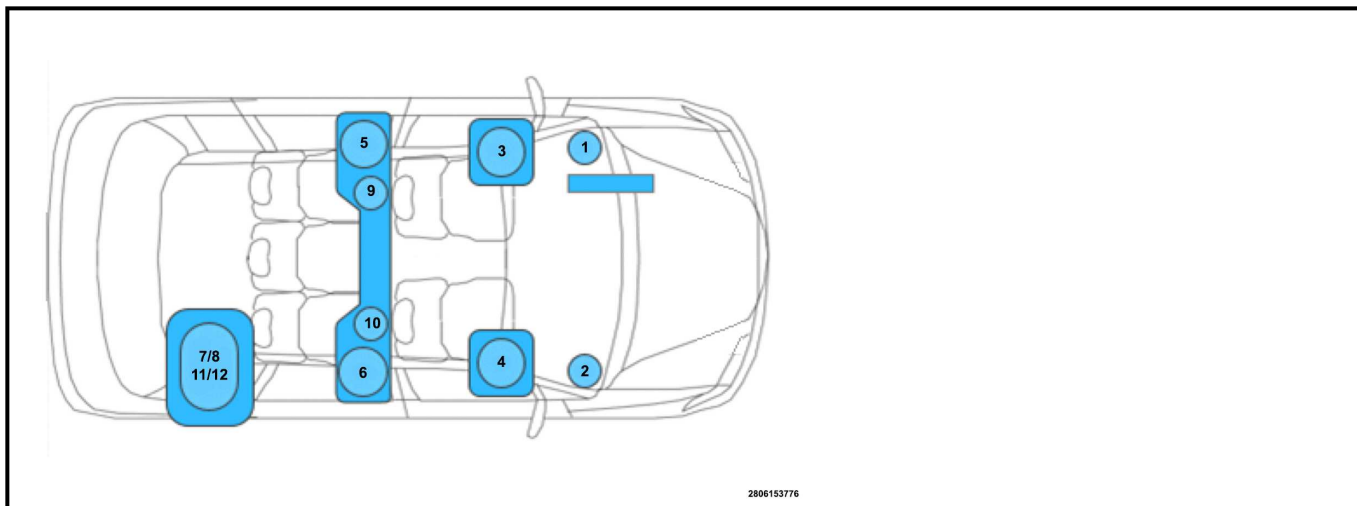
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1465-13-CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

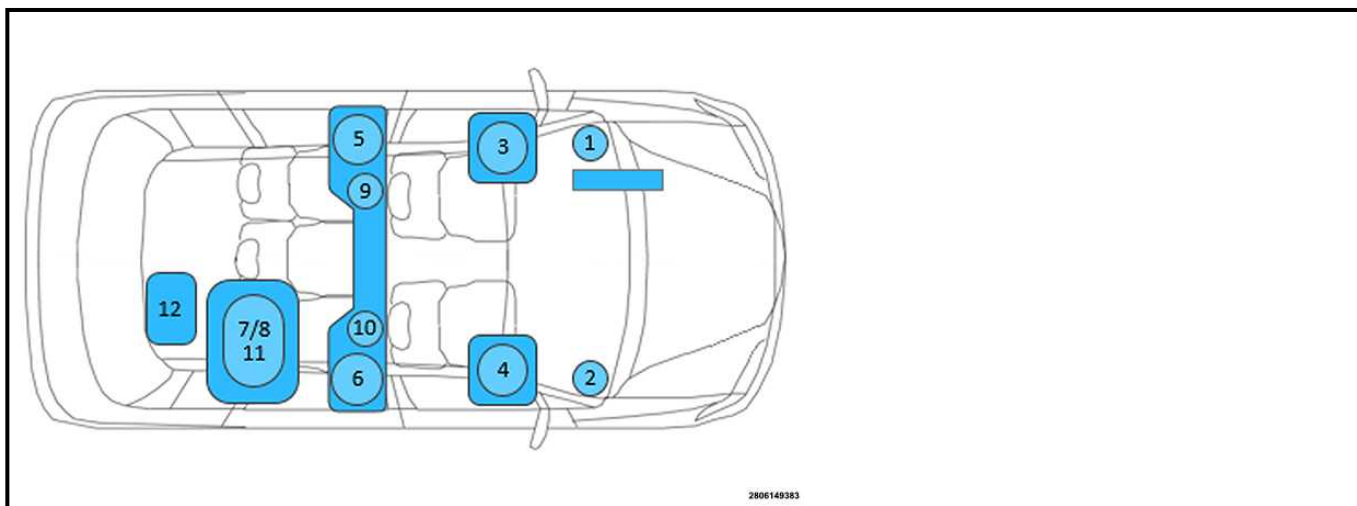
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information .**

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X208	(+)
X298	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .

2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

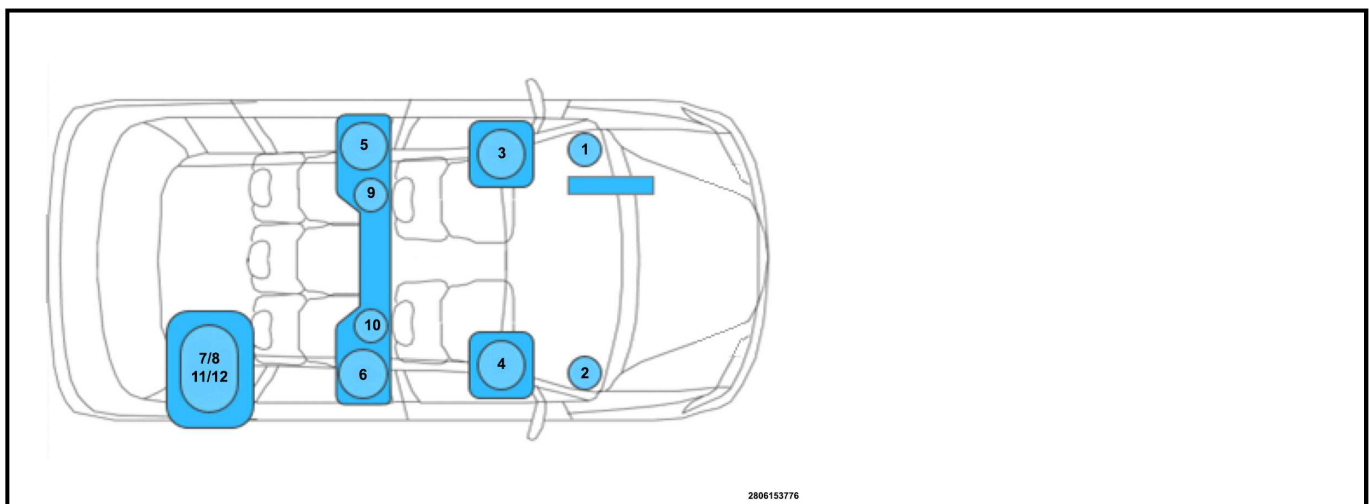
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1465-92-CHANNEL 2 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

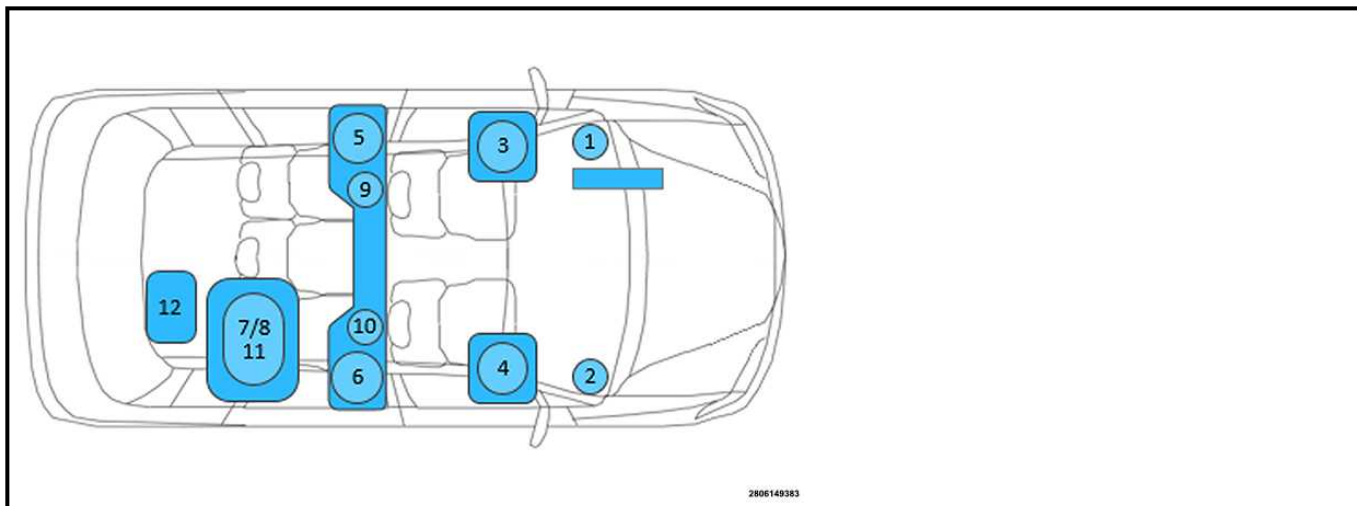
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

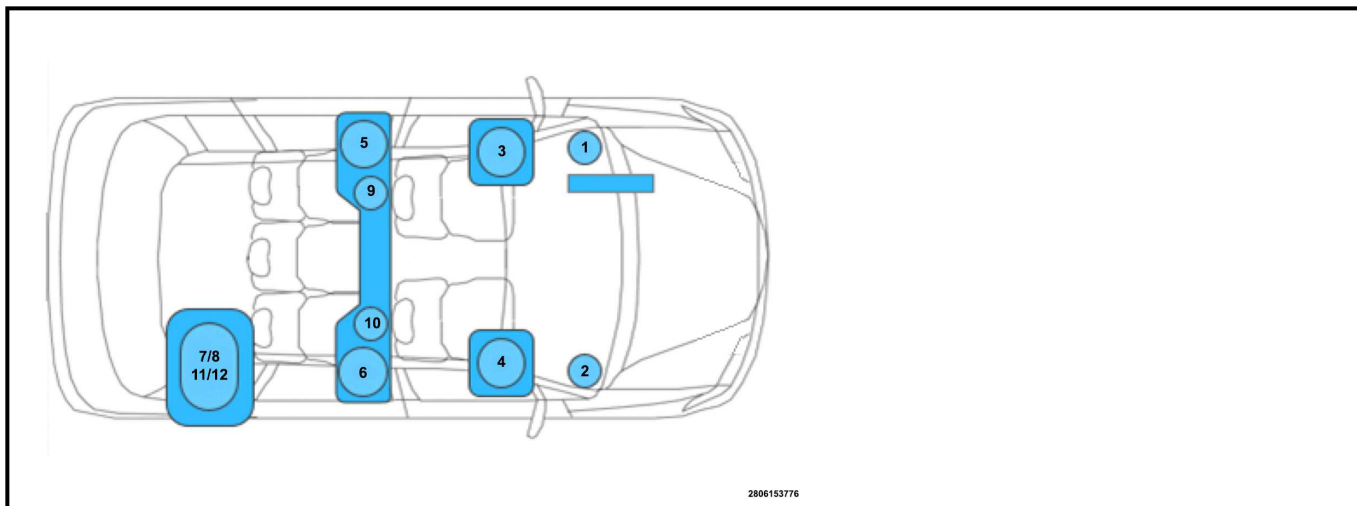
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1469-00-CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

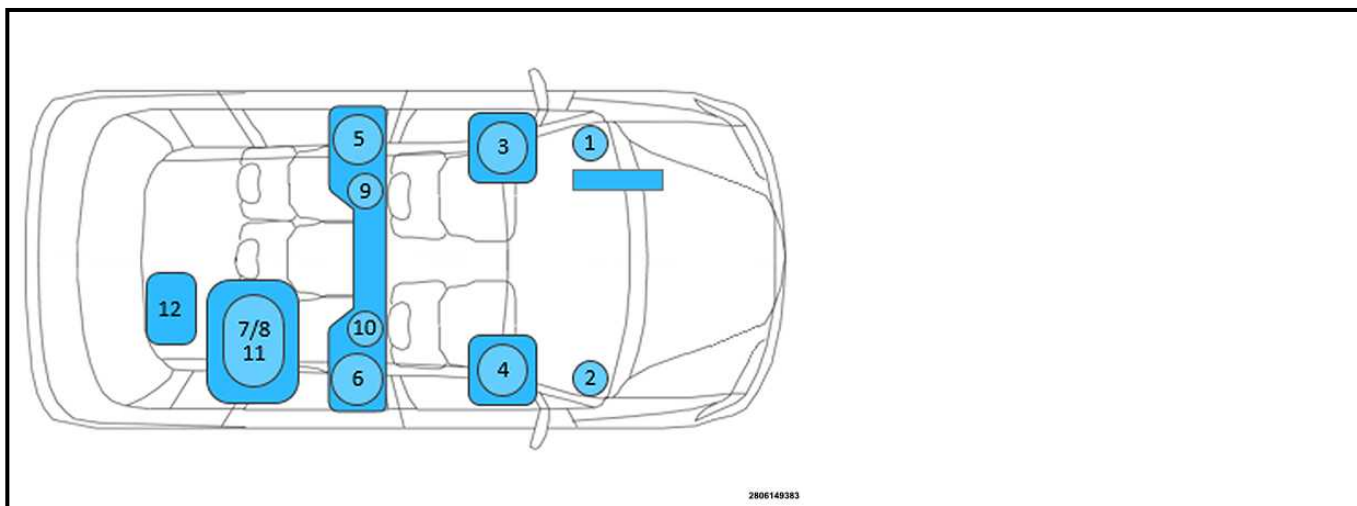
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information .**

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X208	(+)
X298	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

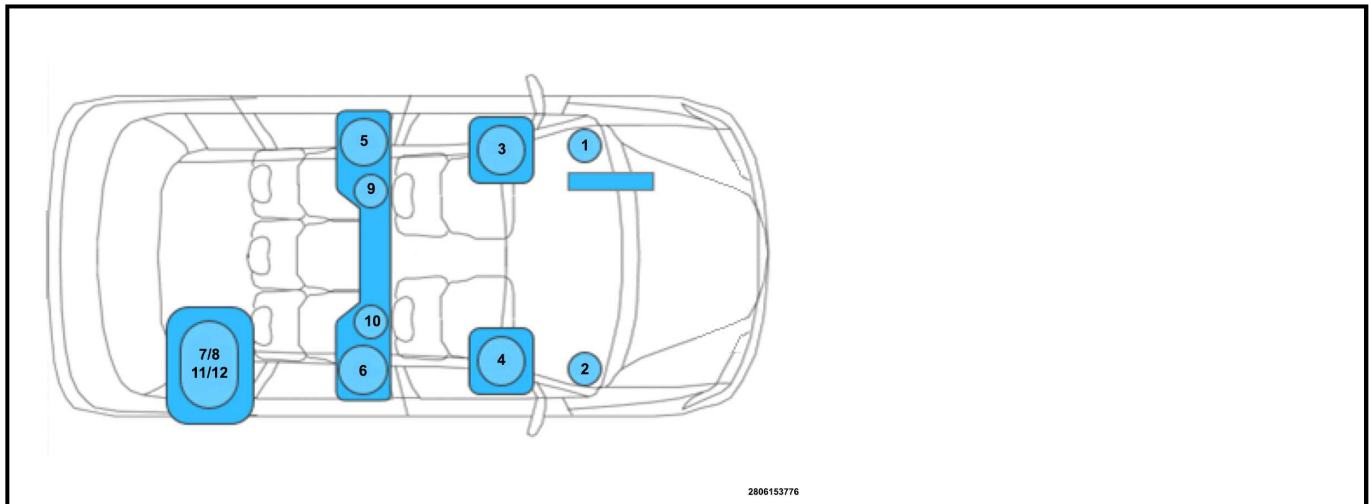
B146A-11-CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

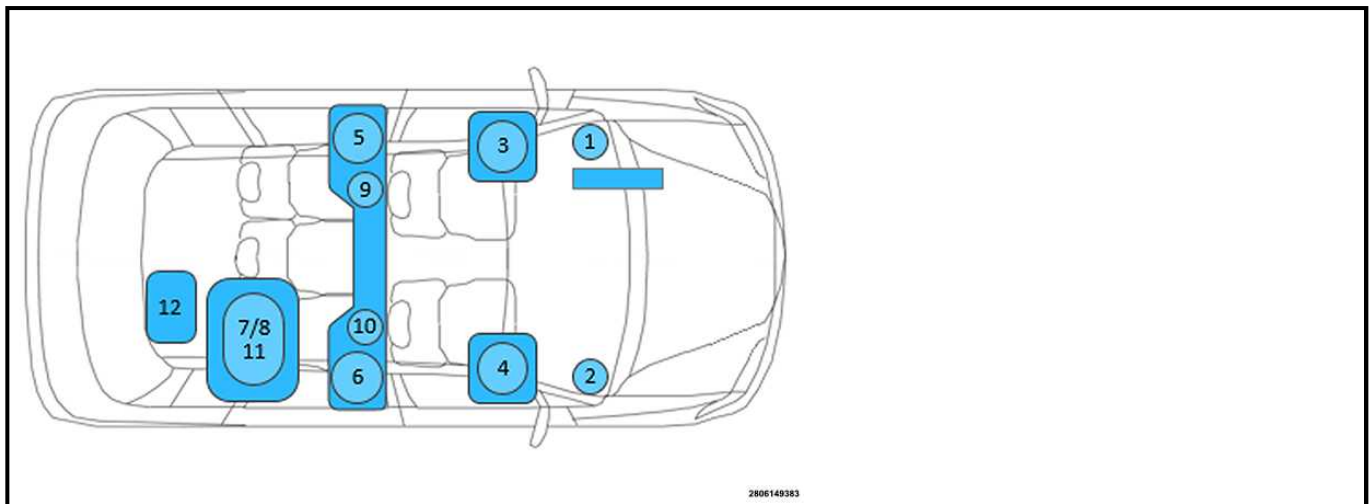
AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify

those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X201	(+)
X291	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to

follow the path of the circuit.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

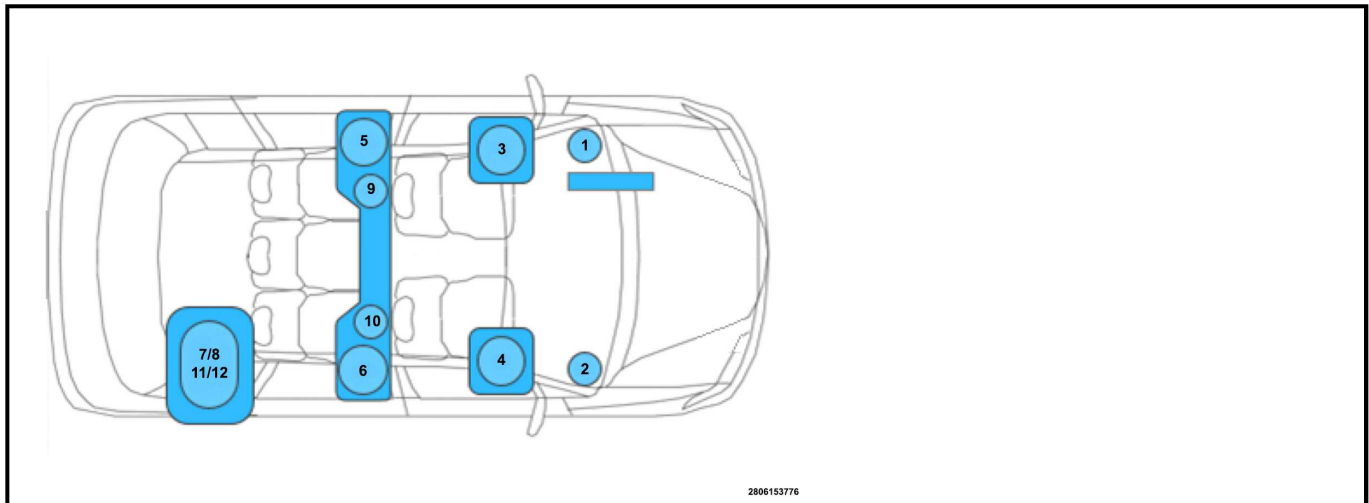
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

B146A-12-CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

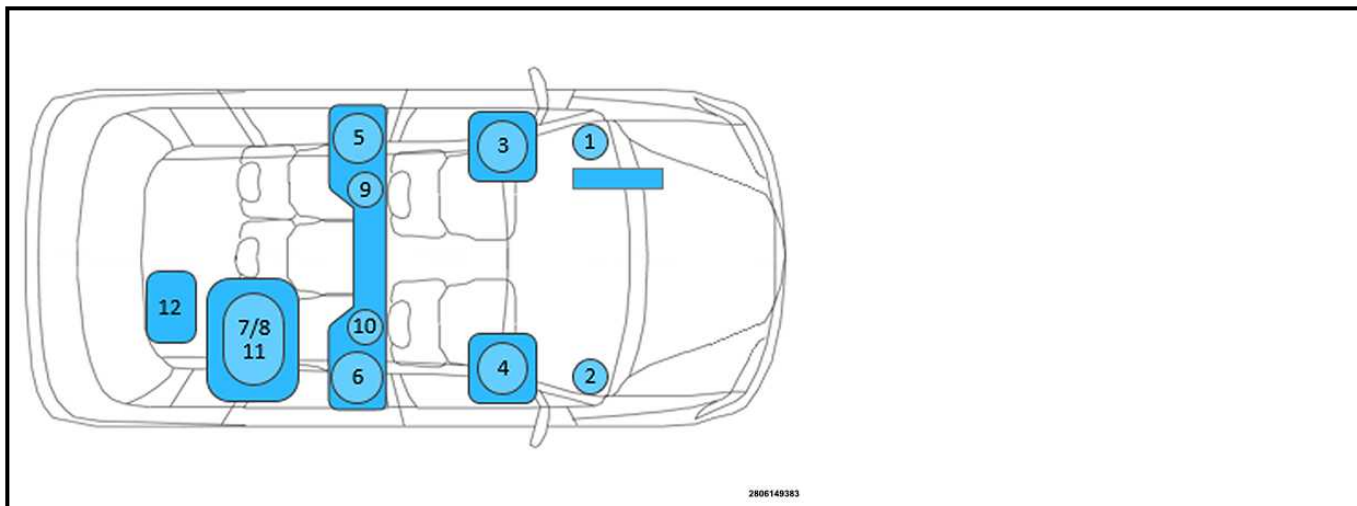
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information**.

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X201	(+)
X291	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

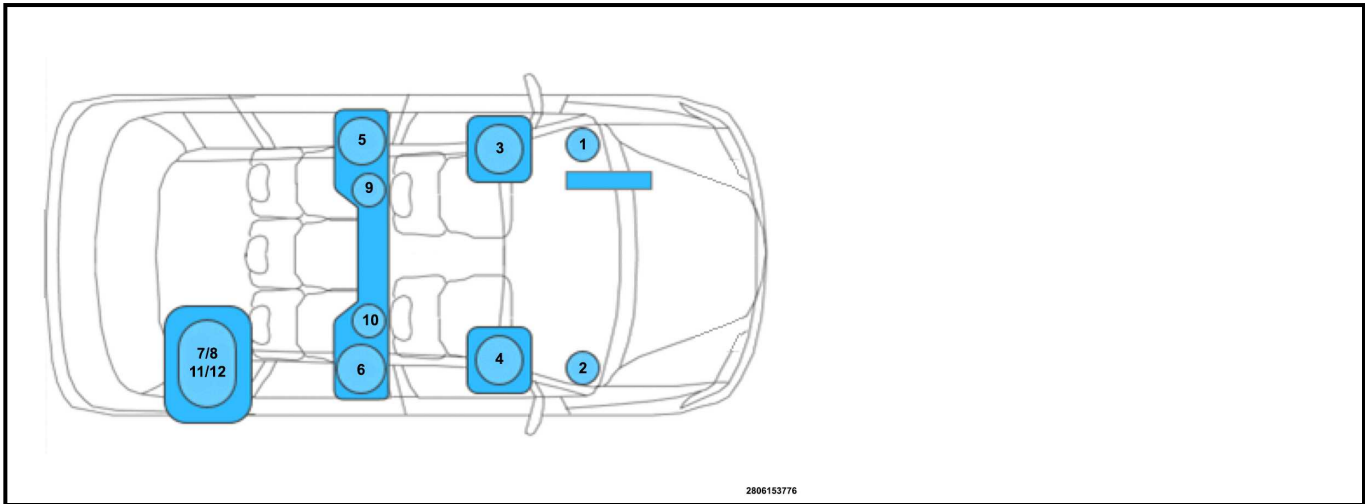
B146A-13-CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

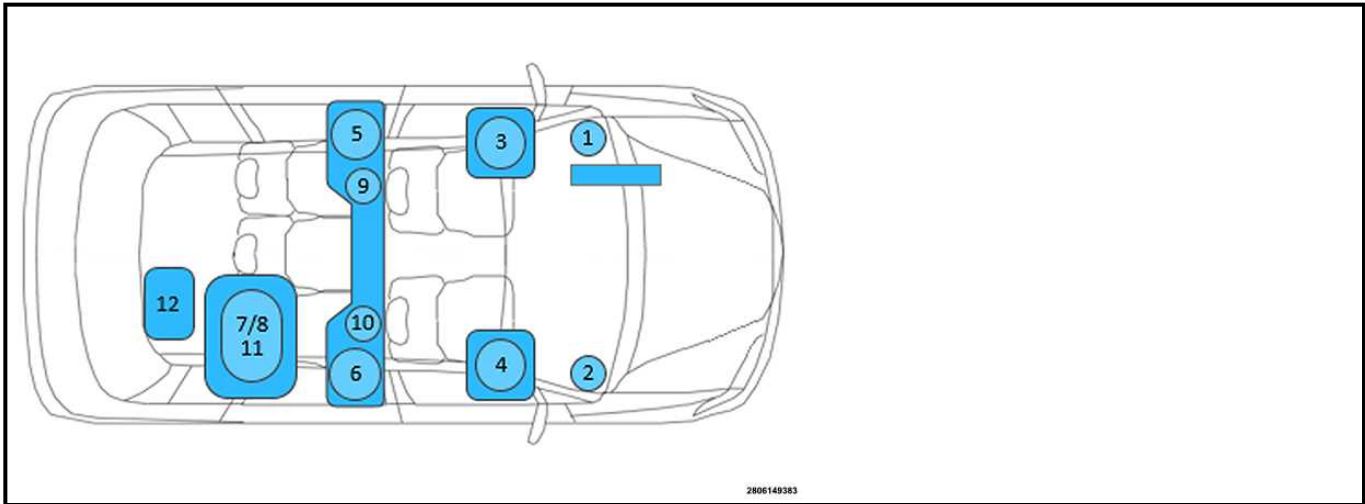
AUDIO CHANNEL MAPPING

NOTE:

Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X201	(+)
X291	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

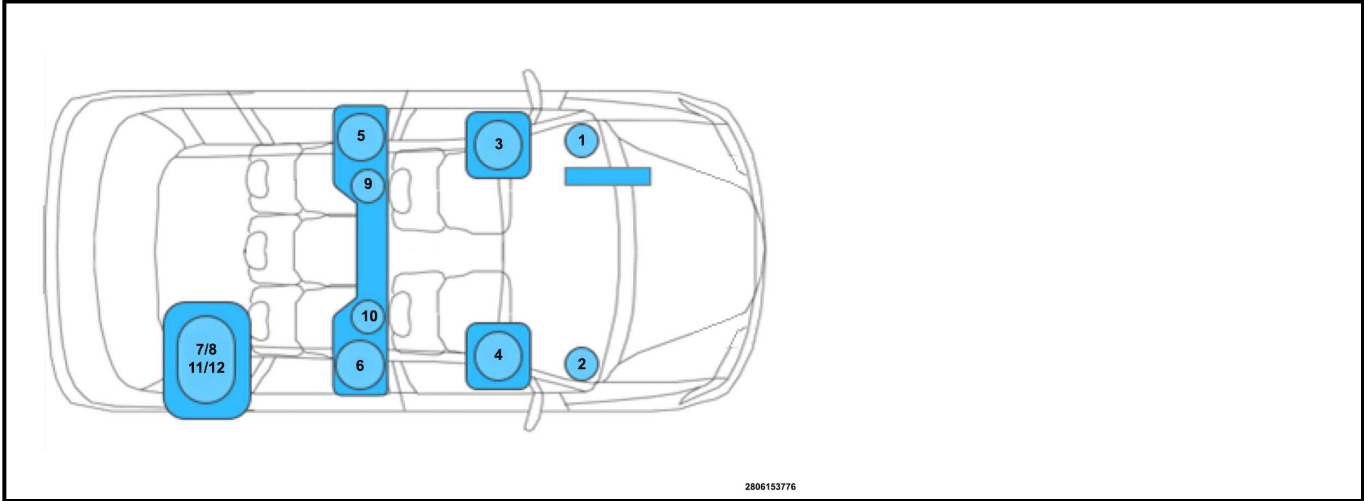
B146A-92-CHANNEL 3 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

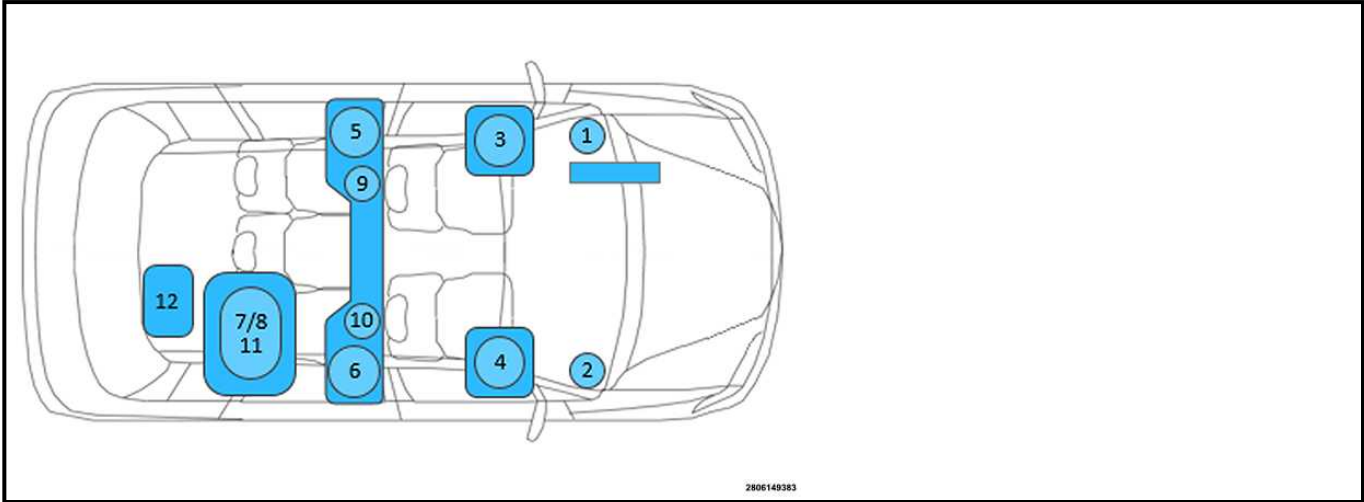
AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of**

Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

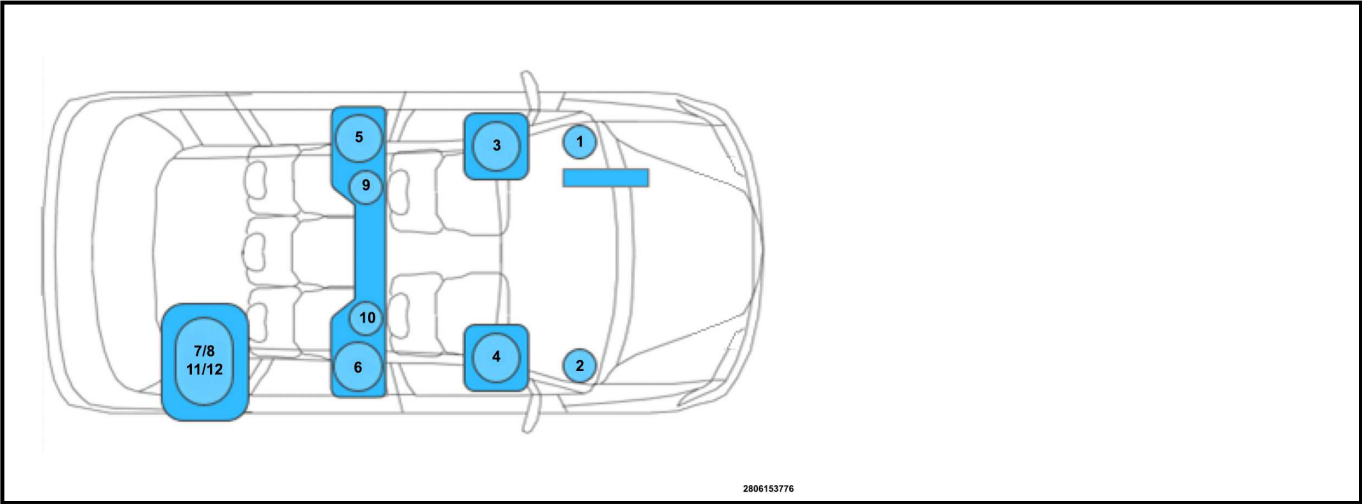
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B146E-00-CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

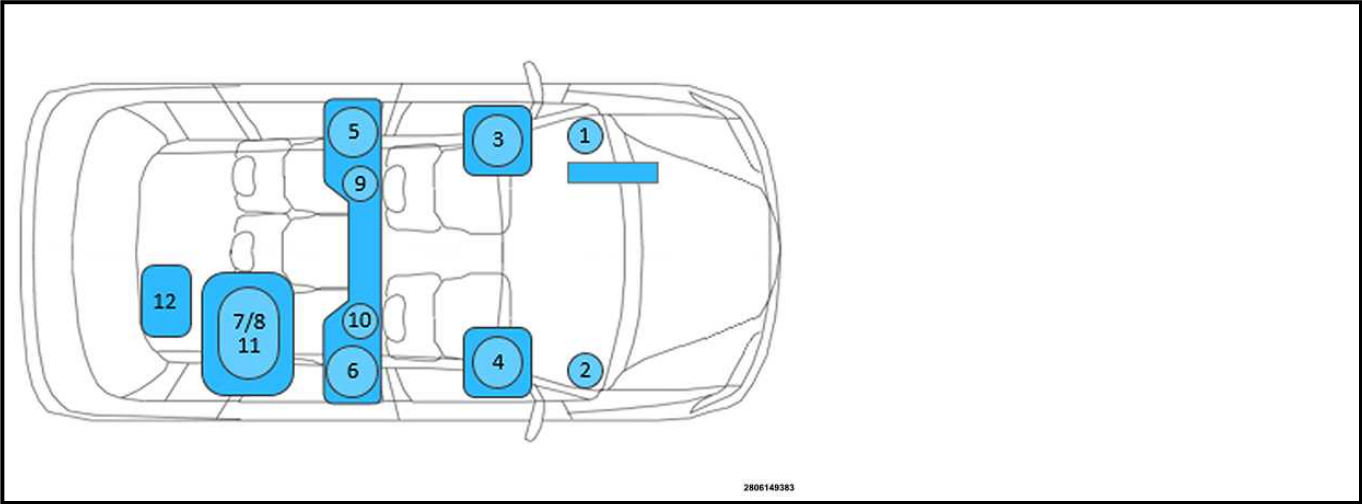
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information.

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X201	(+)
X291	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

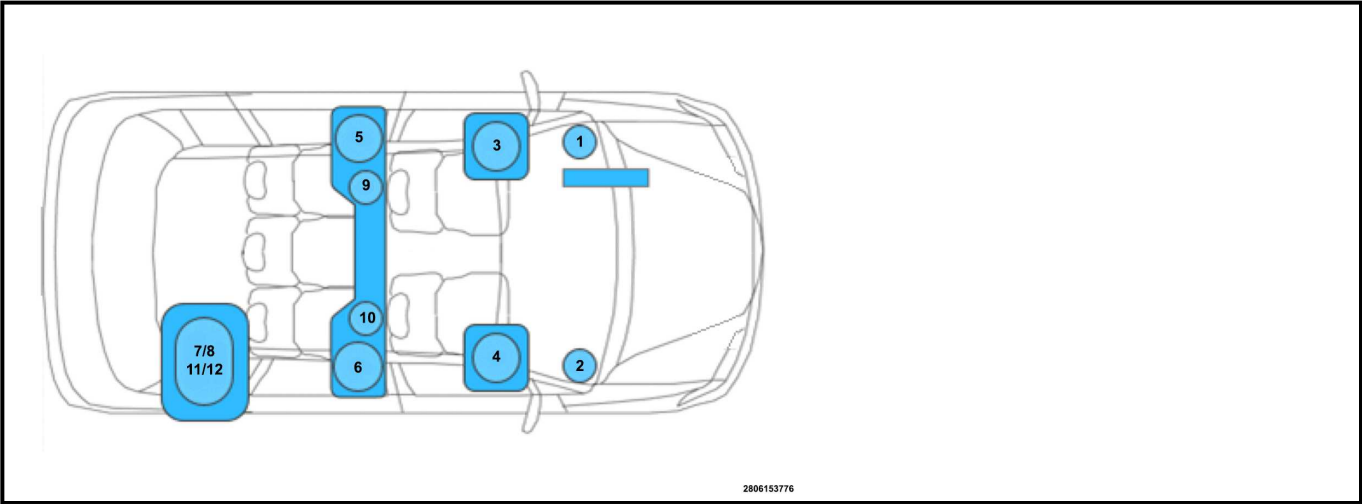
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B146F-11-CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

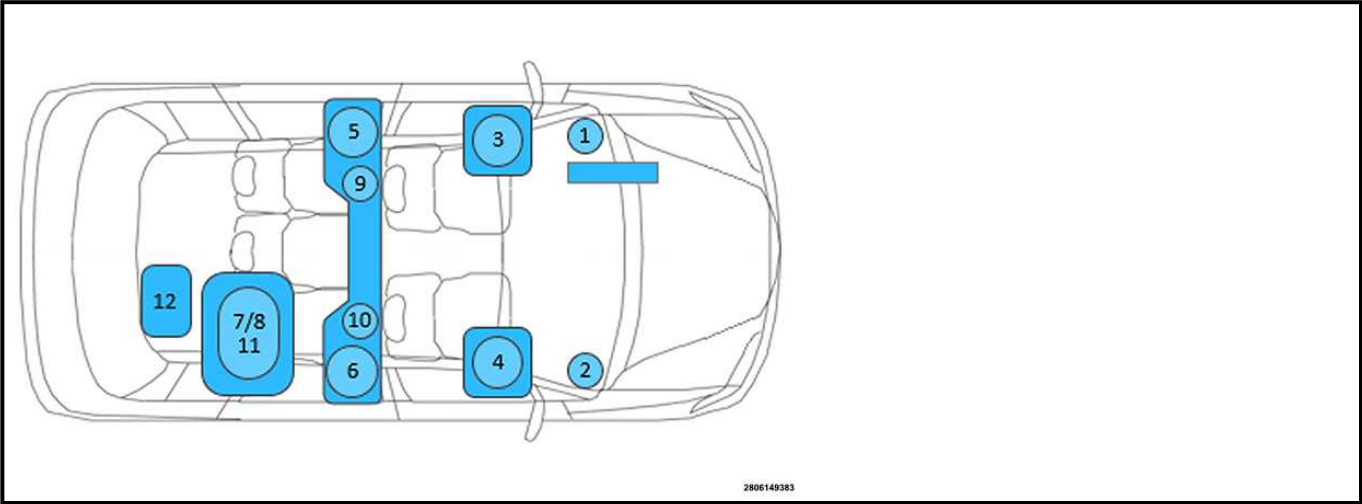
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X202	(+)
X292	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

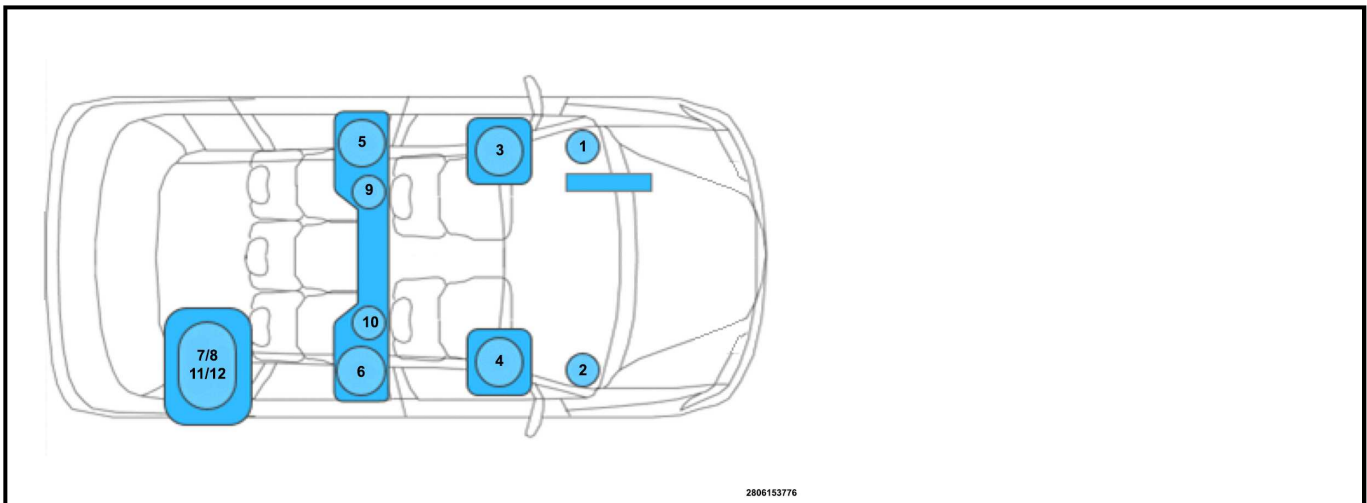
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B146F-12-CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

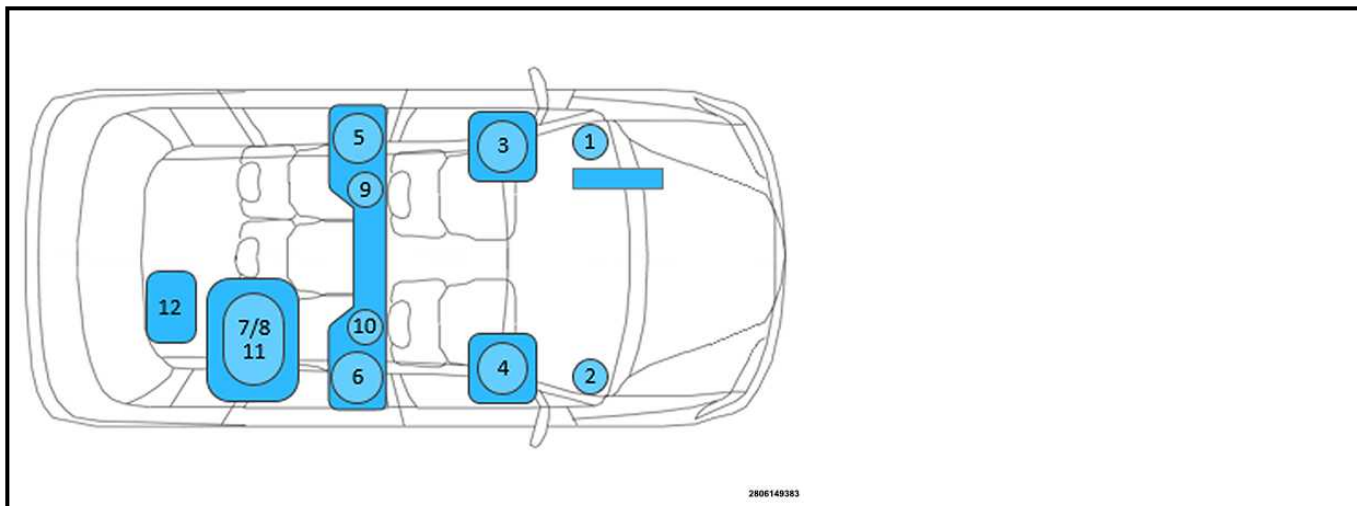
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X202	(+)
X292	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

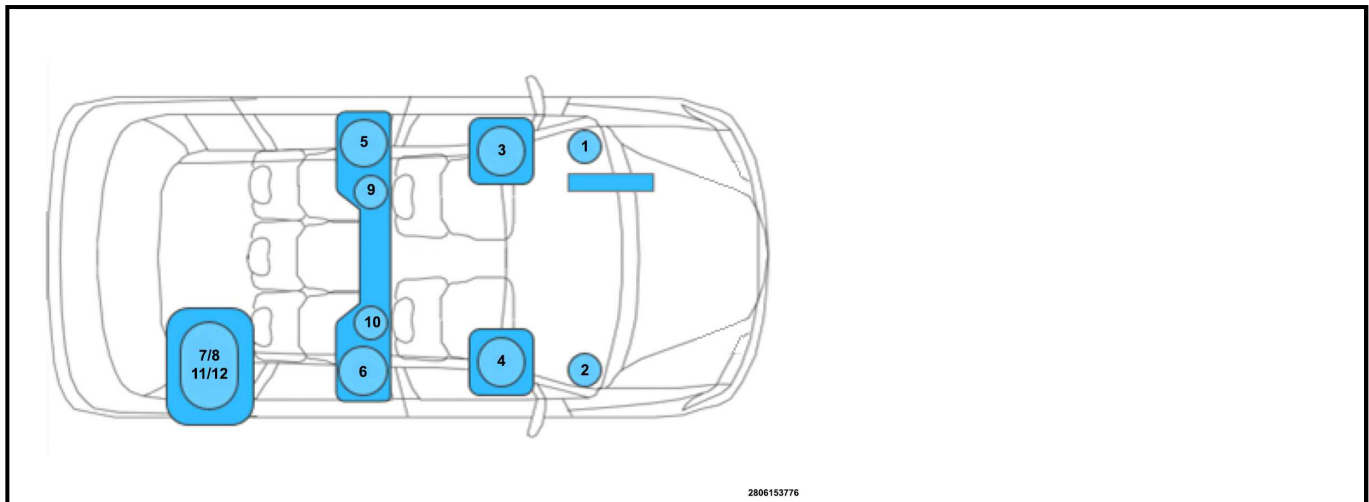
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B146F-13-CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

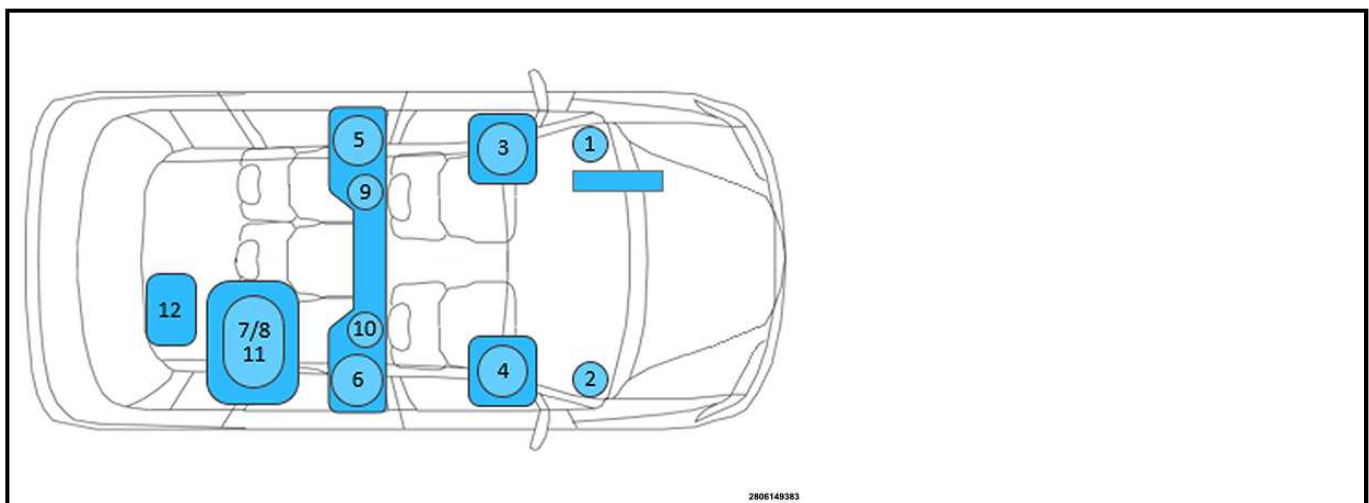
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X202	(+)
X292	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform The Body Verification Test. Refer To [**Body Verification Test**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

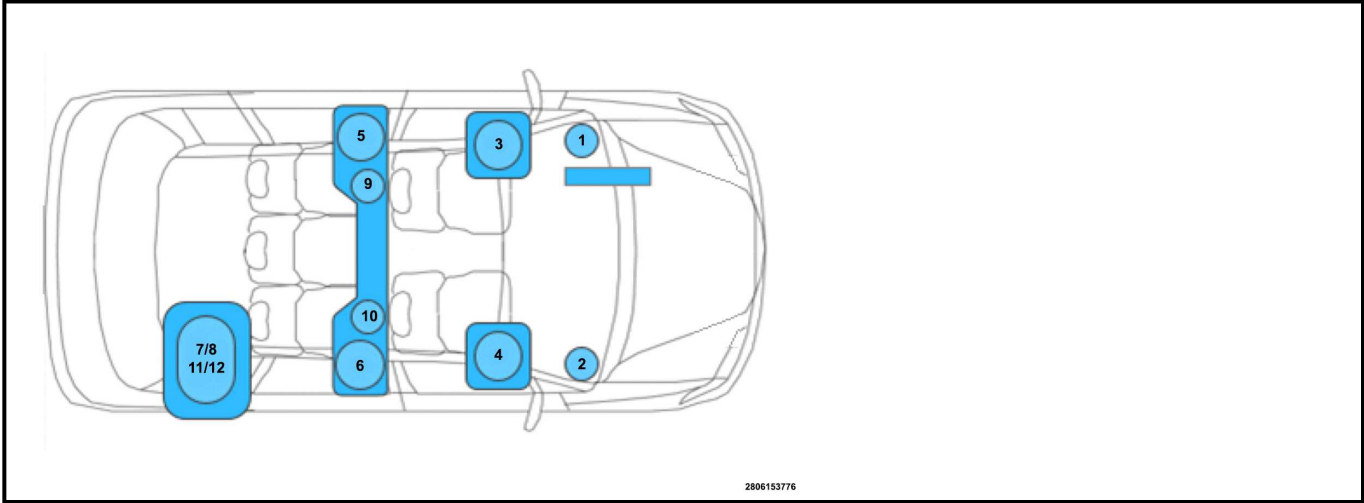
B146F-92-CHANNEL 4 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

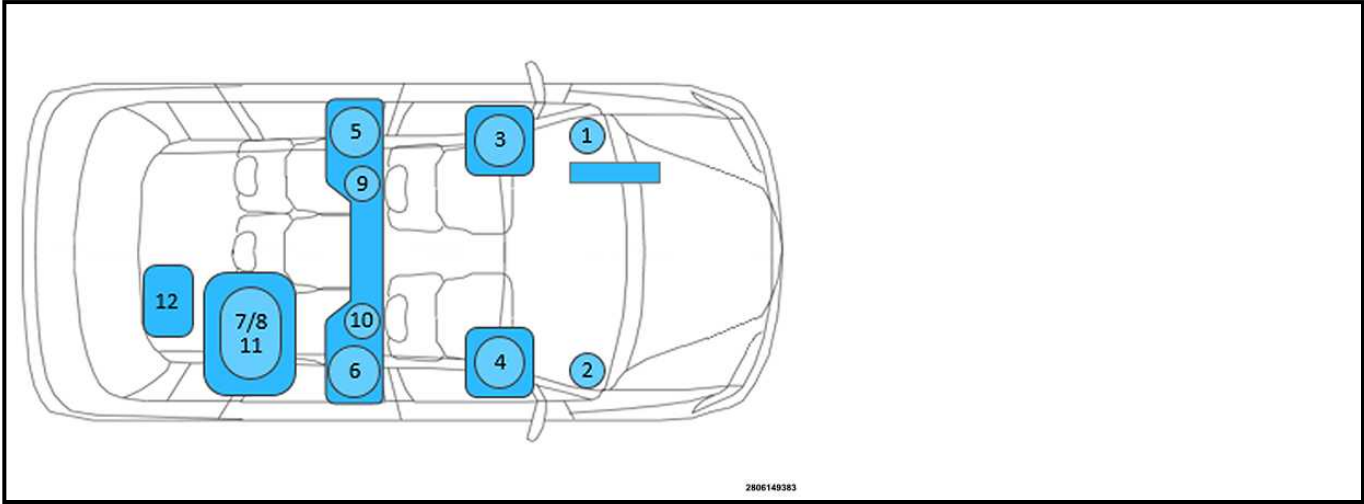
AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of**

Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

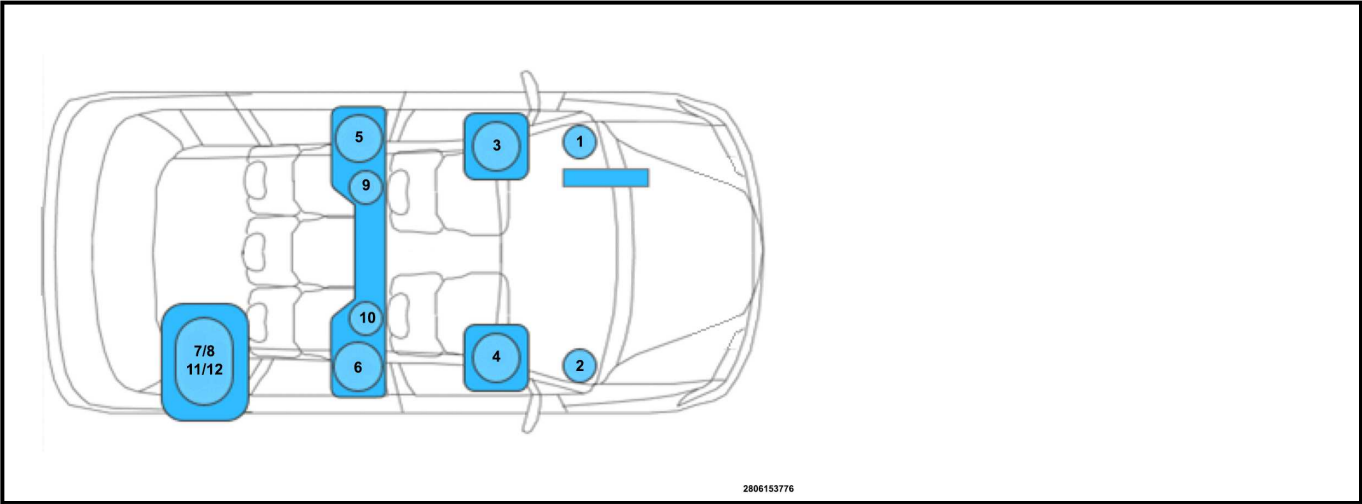
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B1473-00 CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

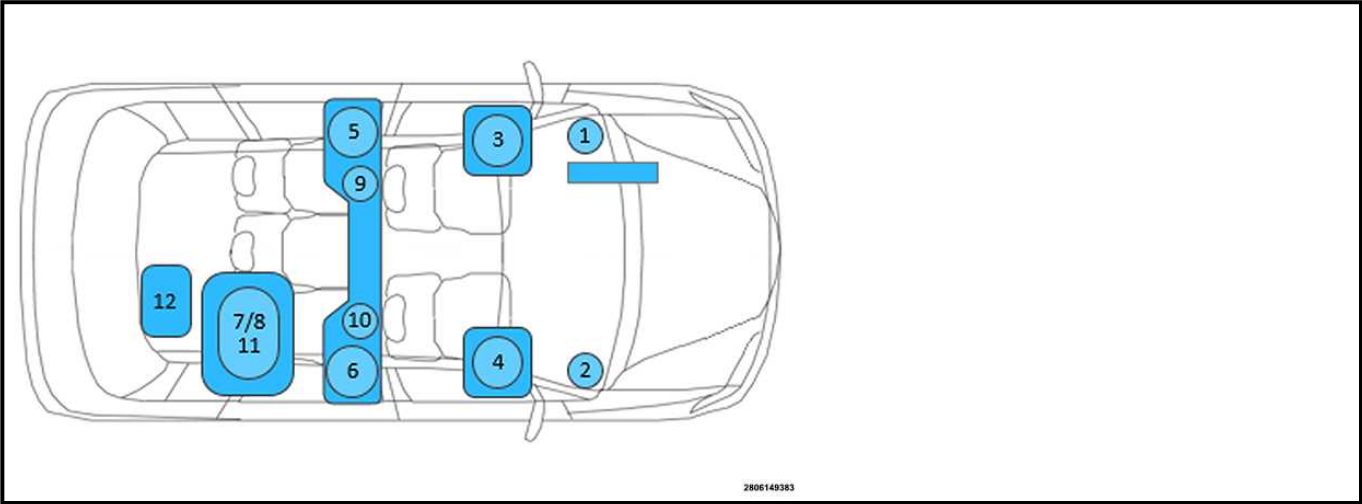
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X202	(+)
X292	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

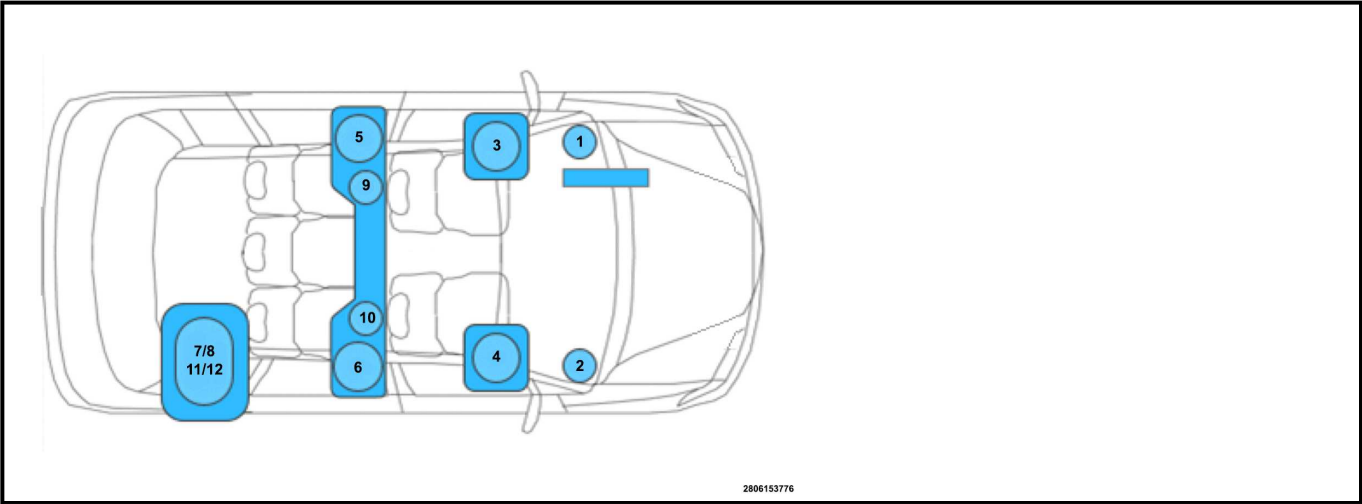
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1474-11-CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

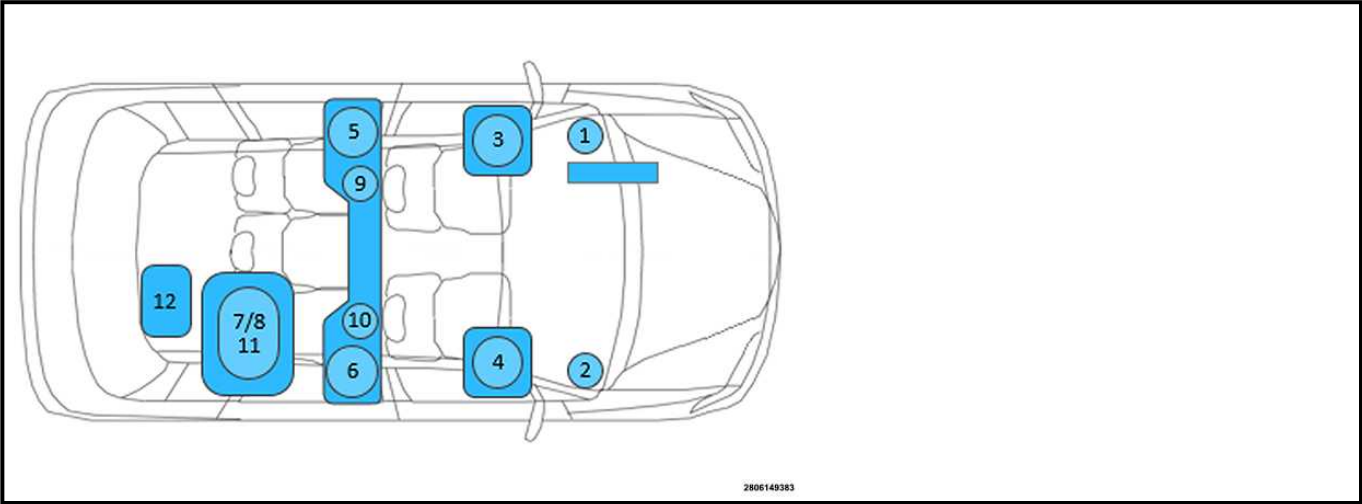
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X205	(+)
X295	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

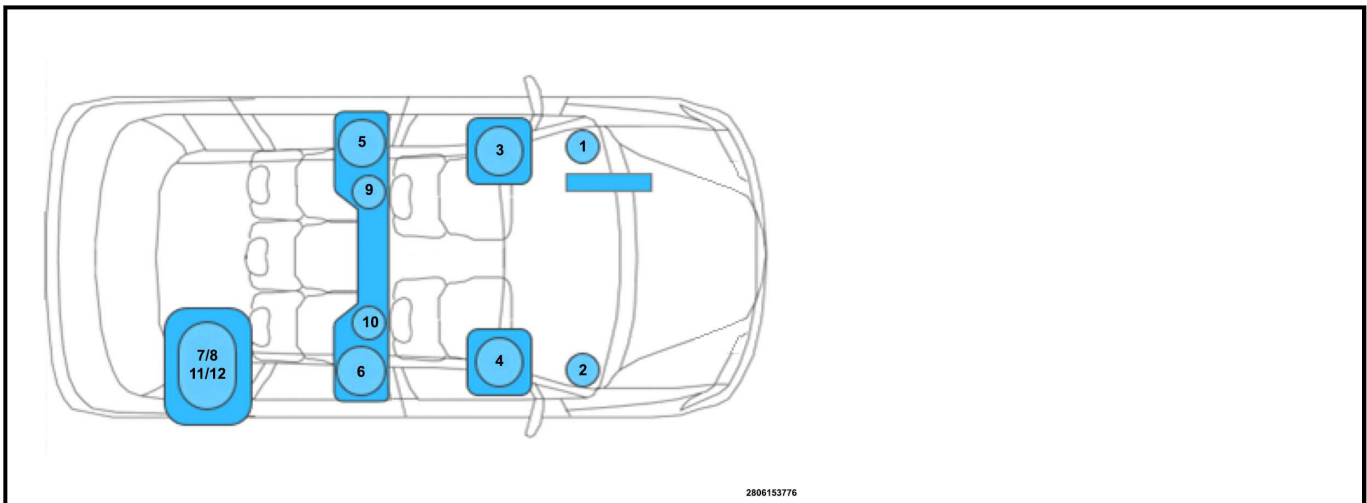
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1474-12-CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

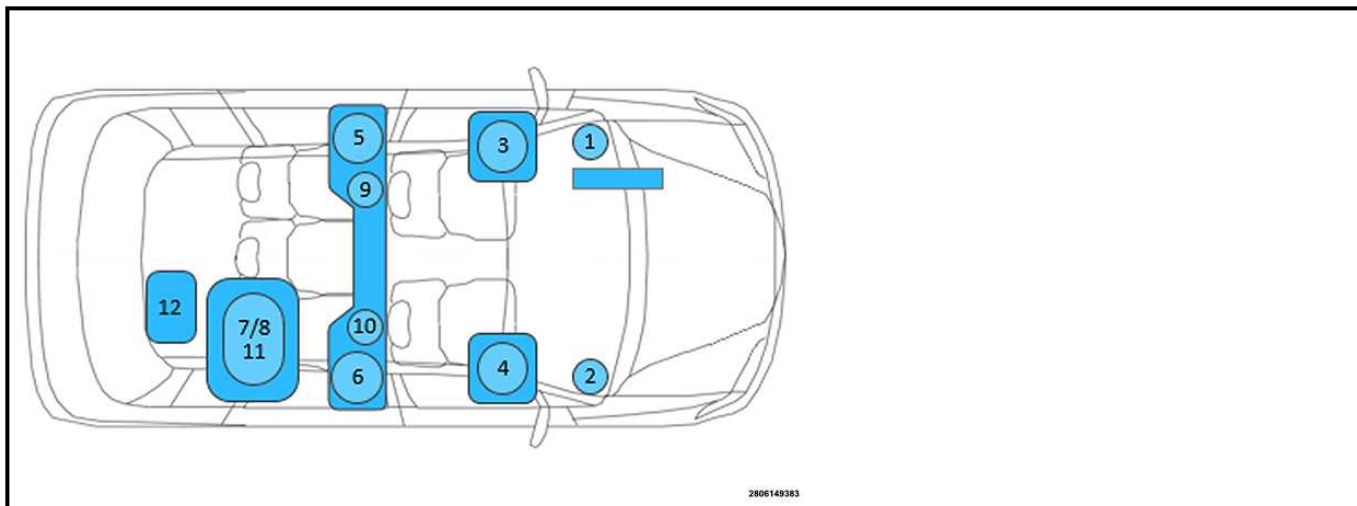
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X205	(+)
X295	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

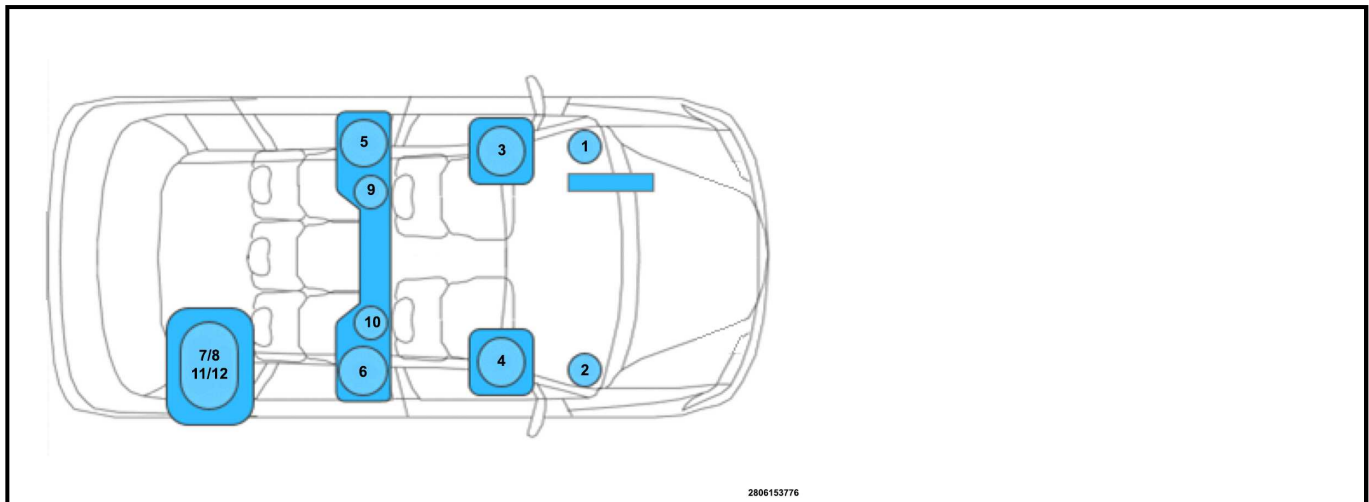
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1474-13-CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

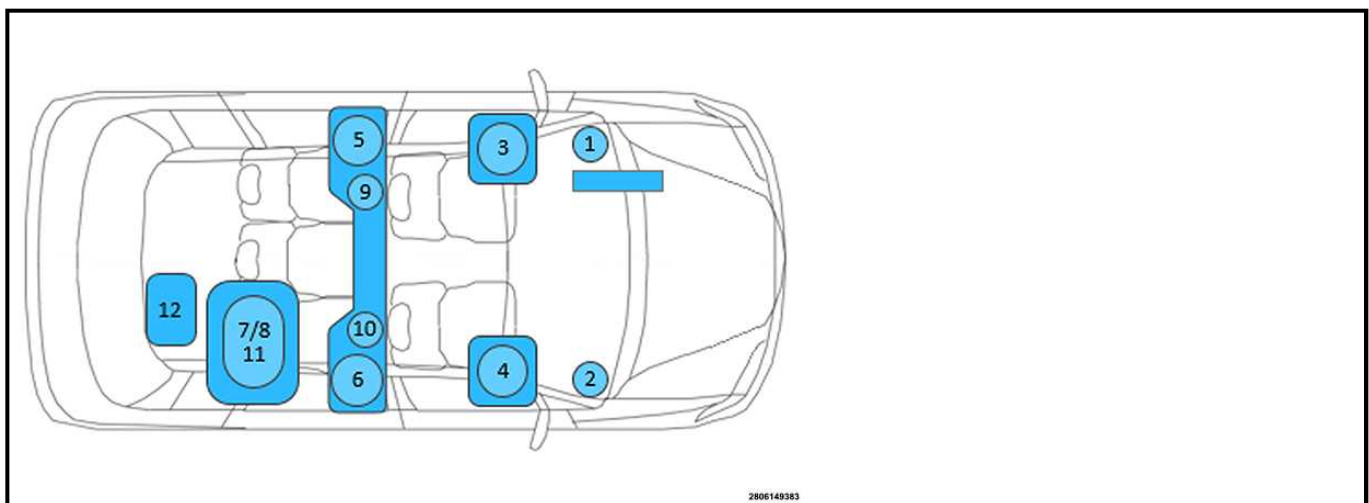
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X205	(+)
X295	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

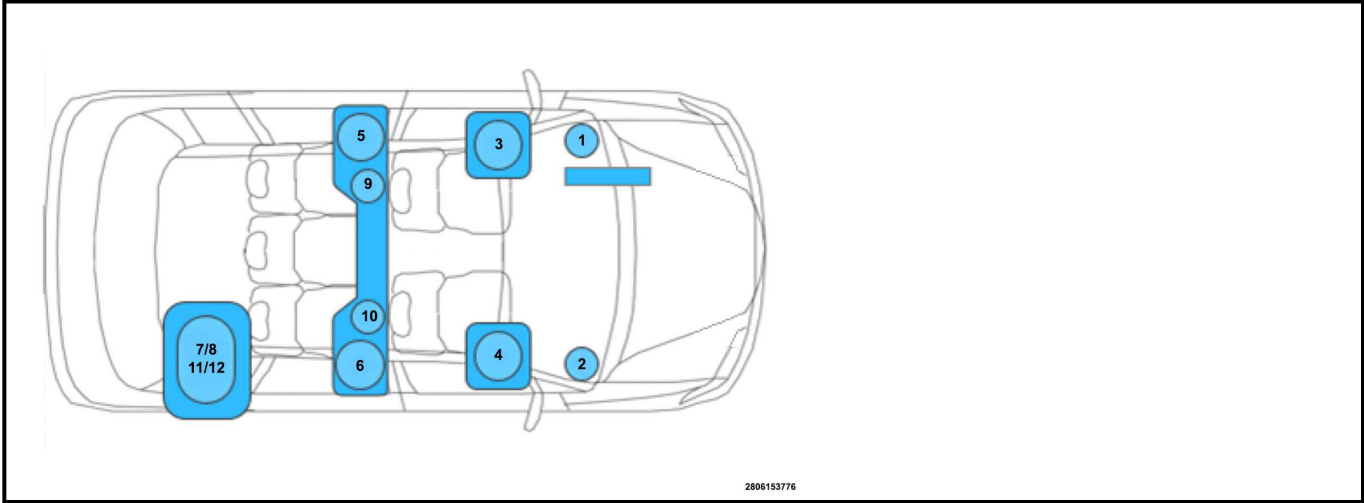
B1474-92-CHANNEL 5 AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

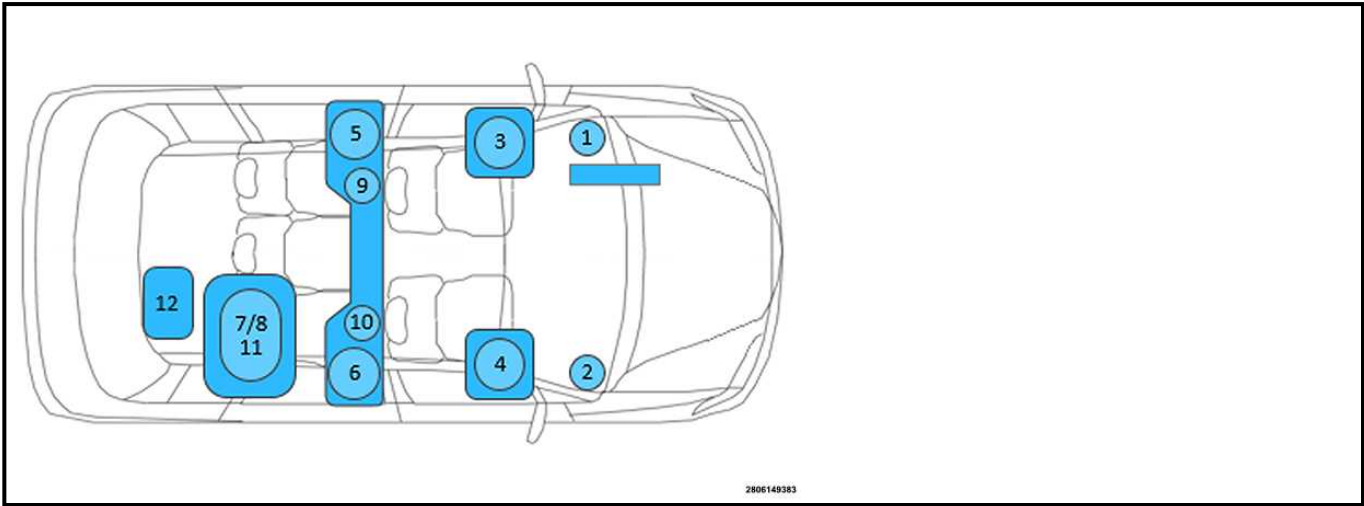
AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of**

Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

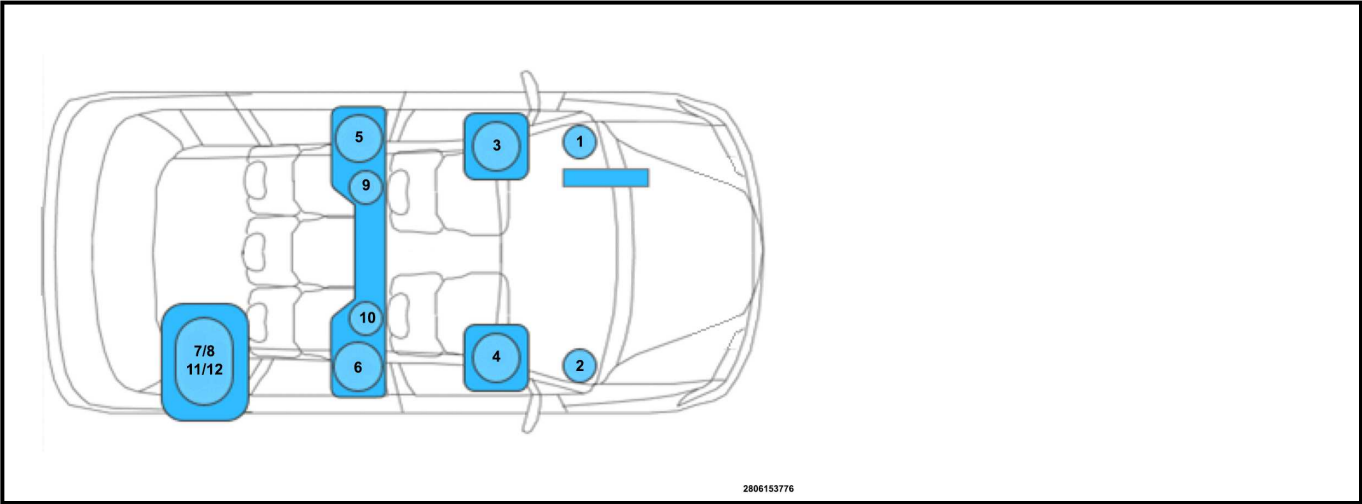
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B1478-00-CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

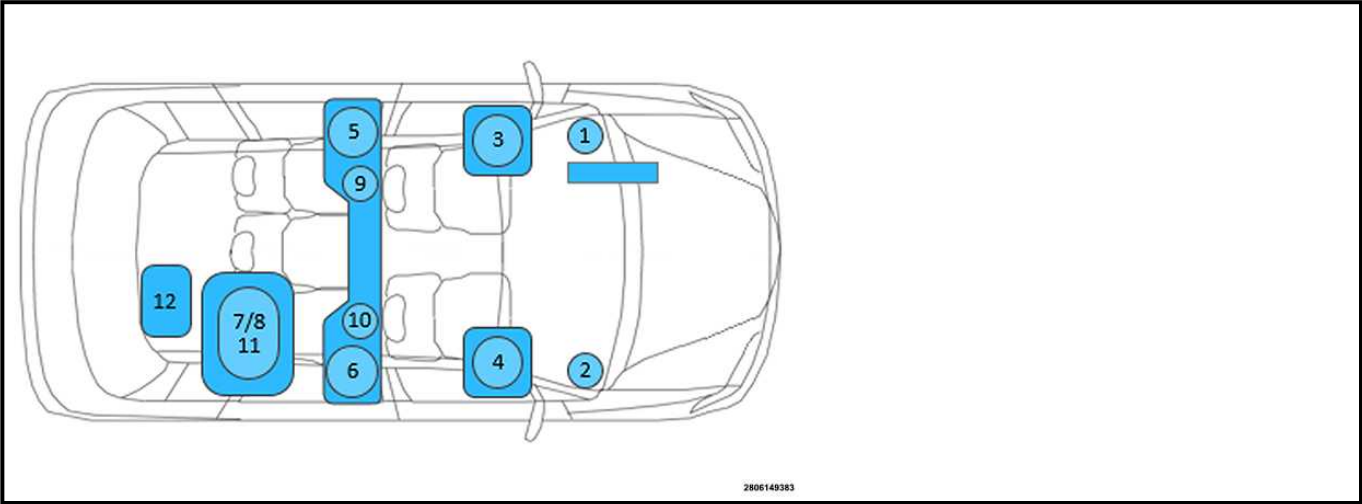
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information.

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X205	(+)
X295	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

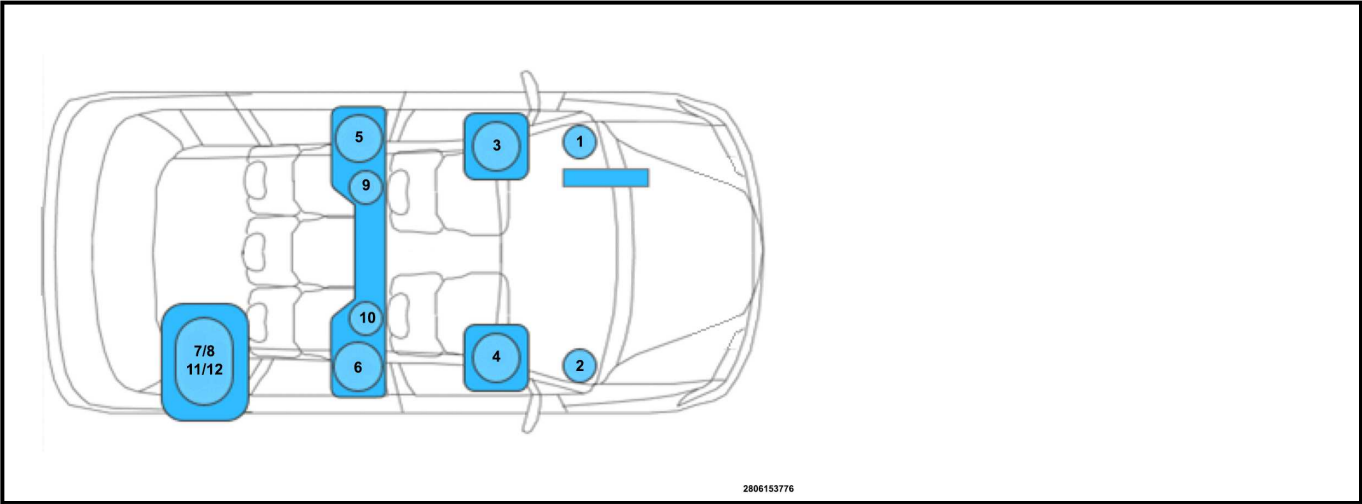
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1479-11-CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

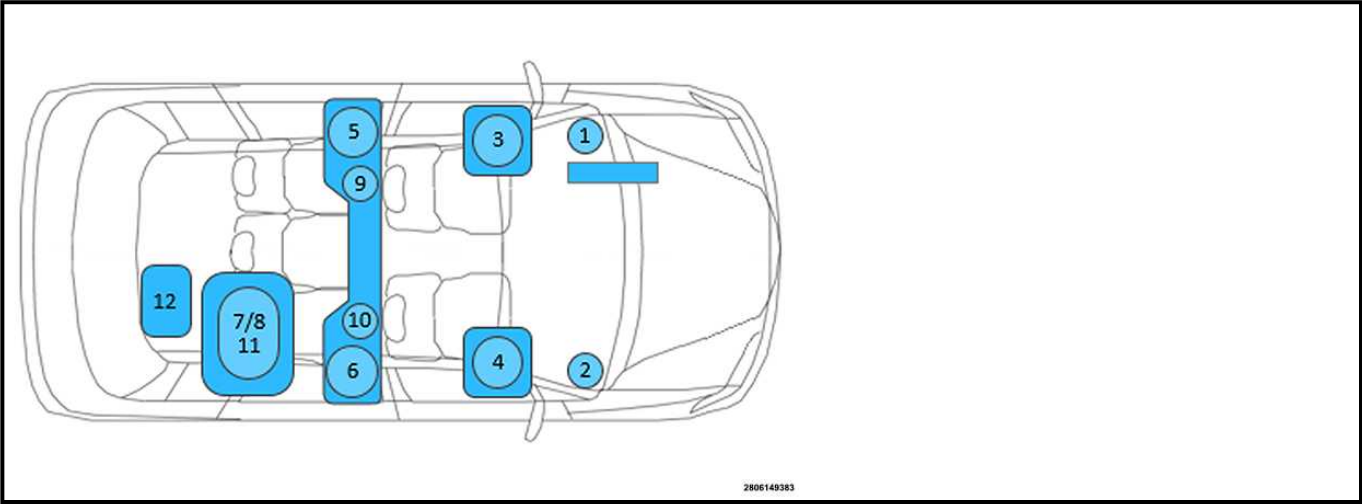
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X206	(+)
X296	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

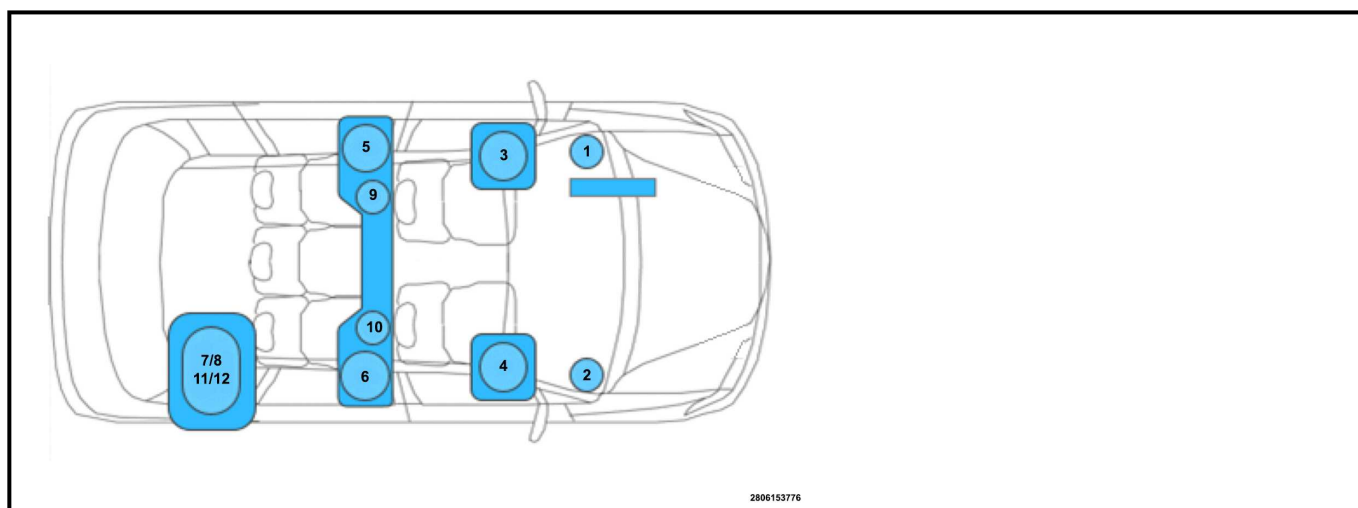
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1479-12-CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

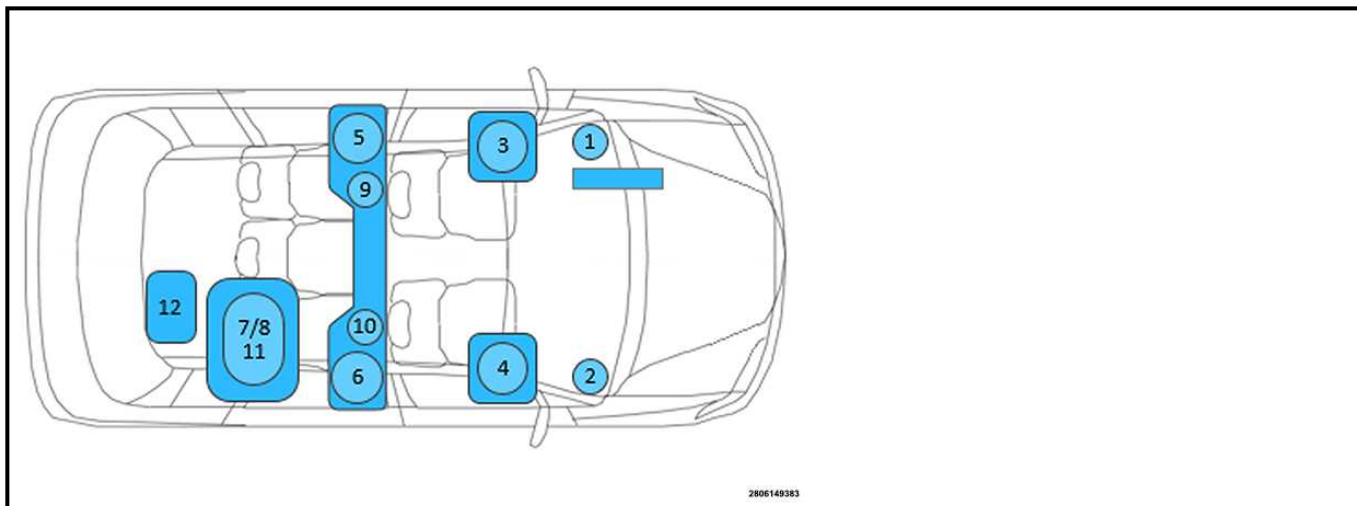
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X206	(+)
X296	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

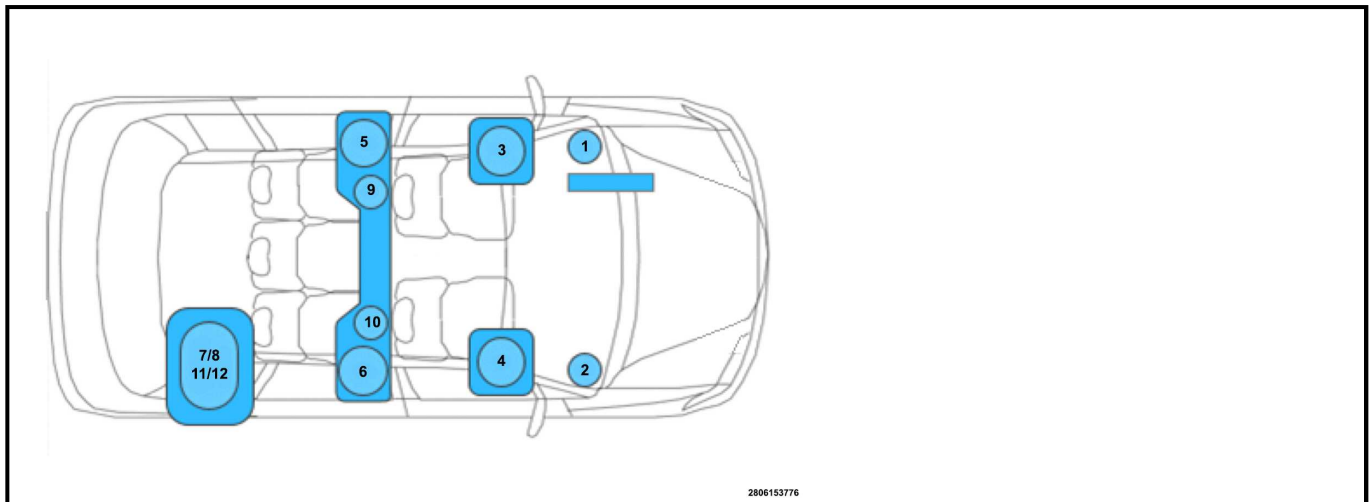
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1479-13-CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

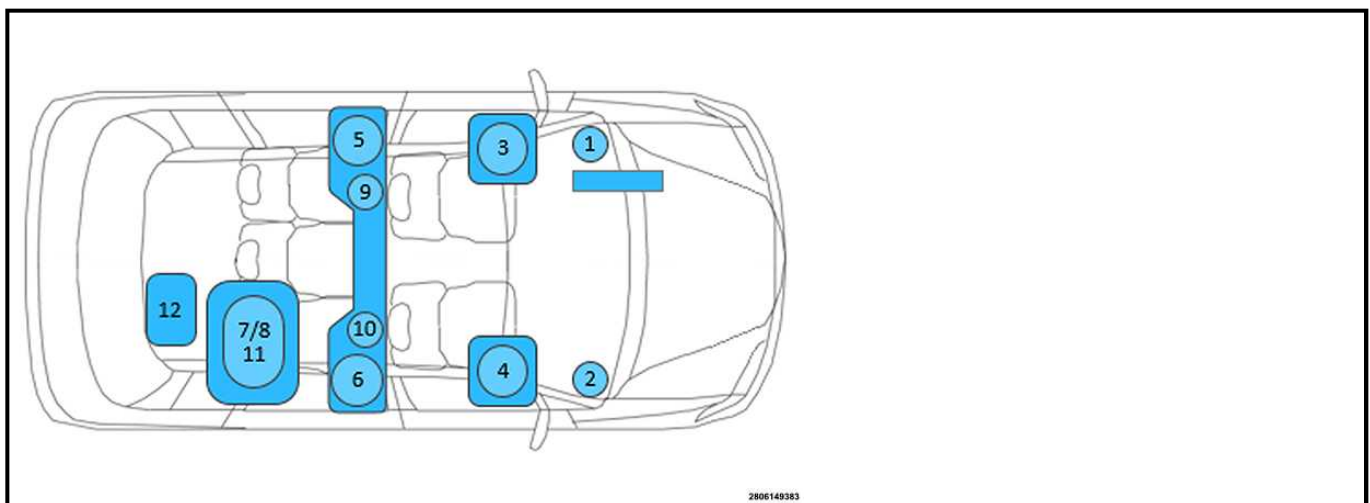
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X206	(+)
X296	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

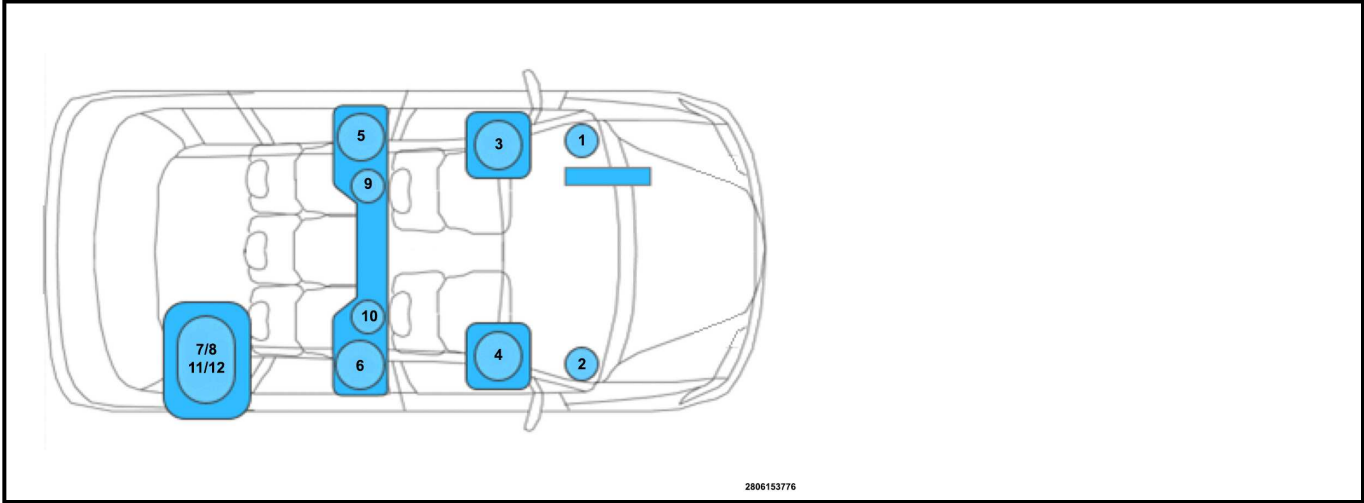
B1479-92-CHANNEL 6 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

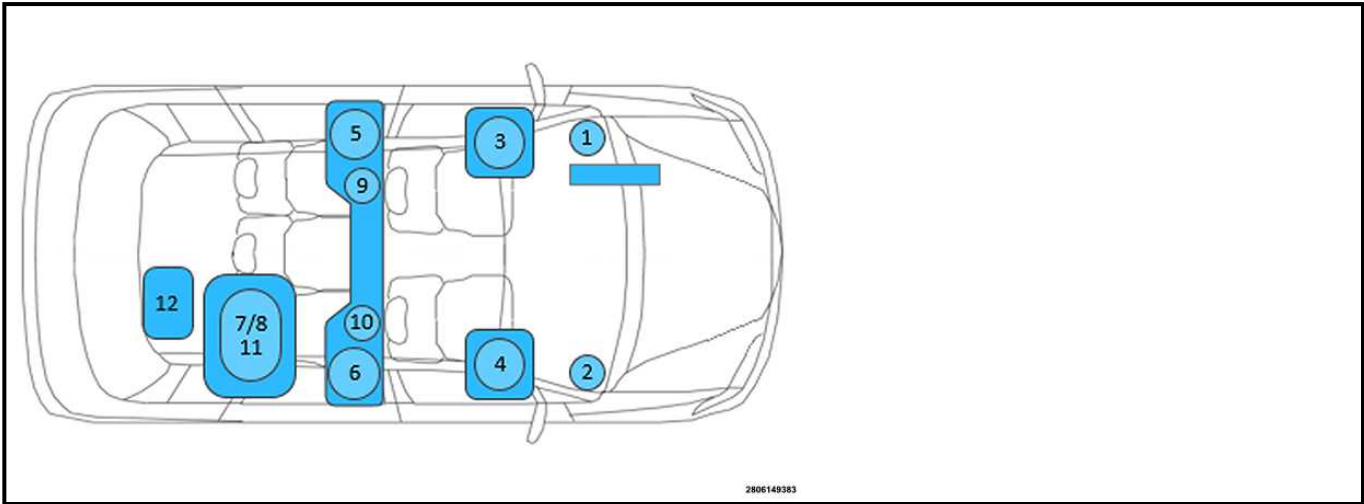
AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of**

Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

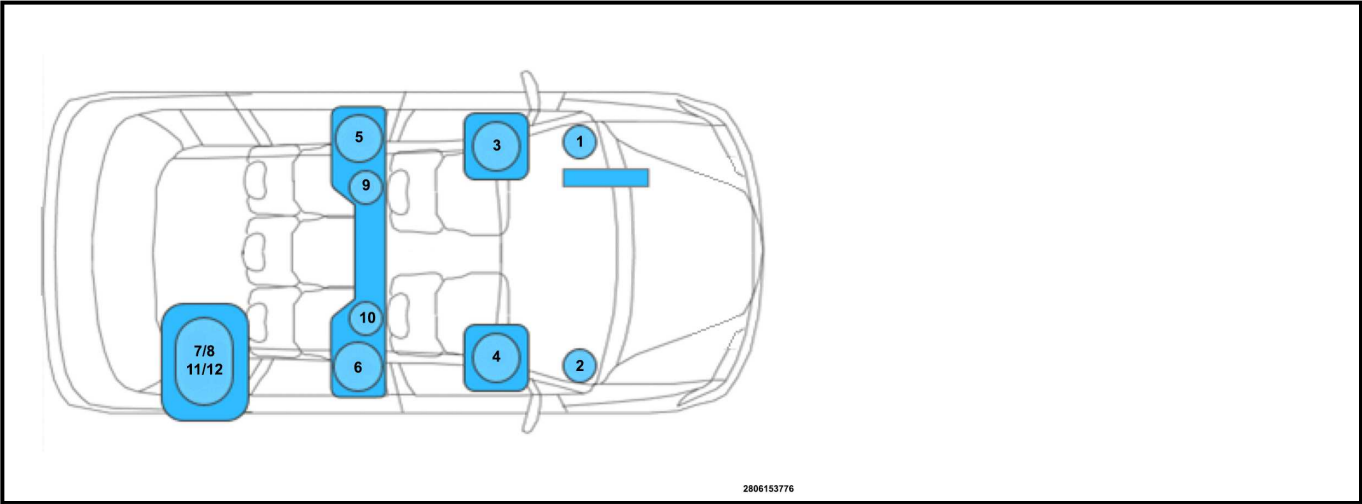
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B147D-00-CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

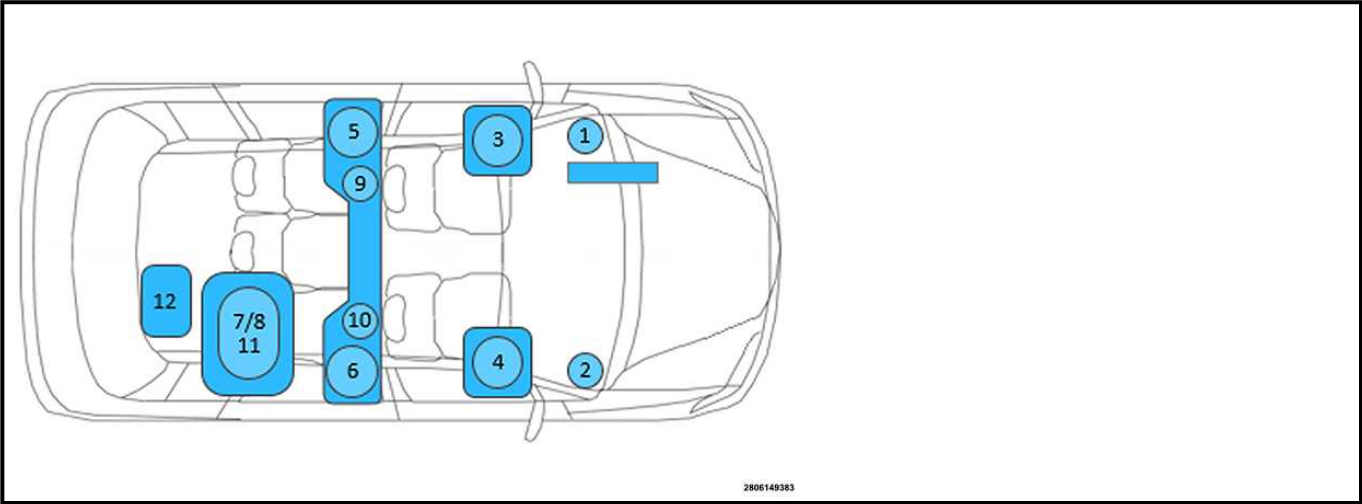
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X206	(+)
X296	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.

4. With the scan tool, erase all DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

8. With the scan tool, read DTCS.

NOTE:

The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

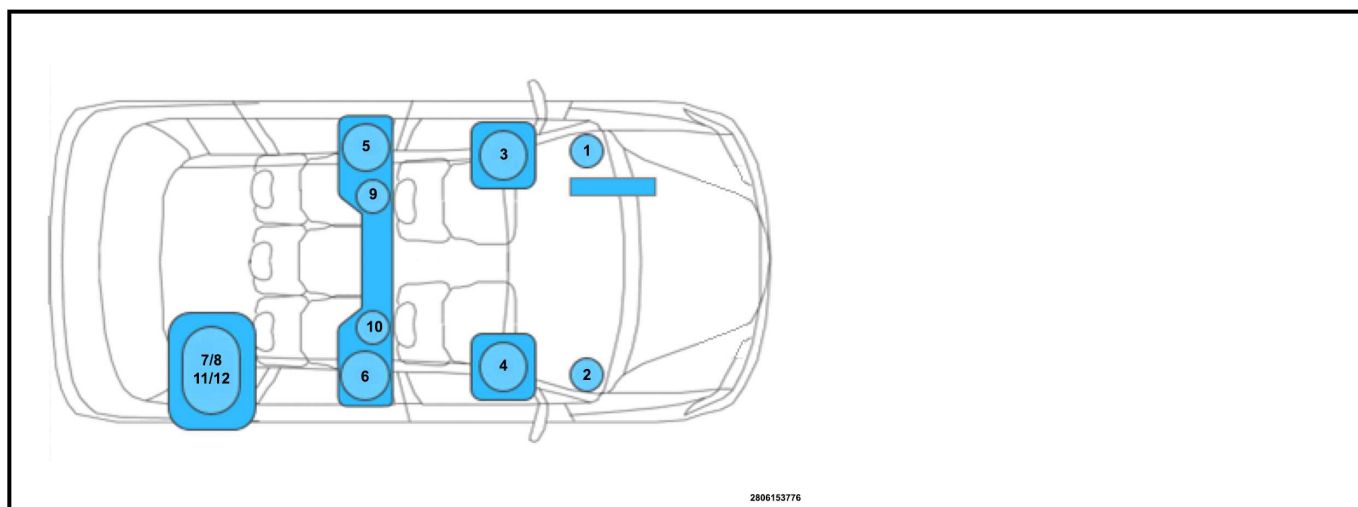
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B147E-11-CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

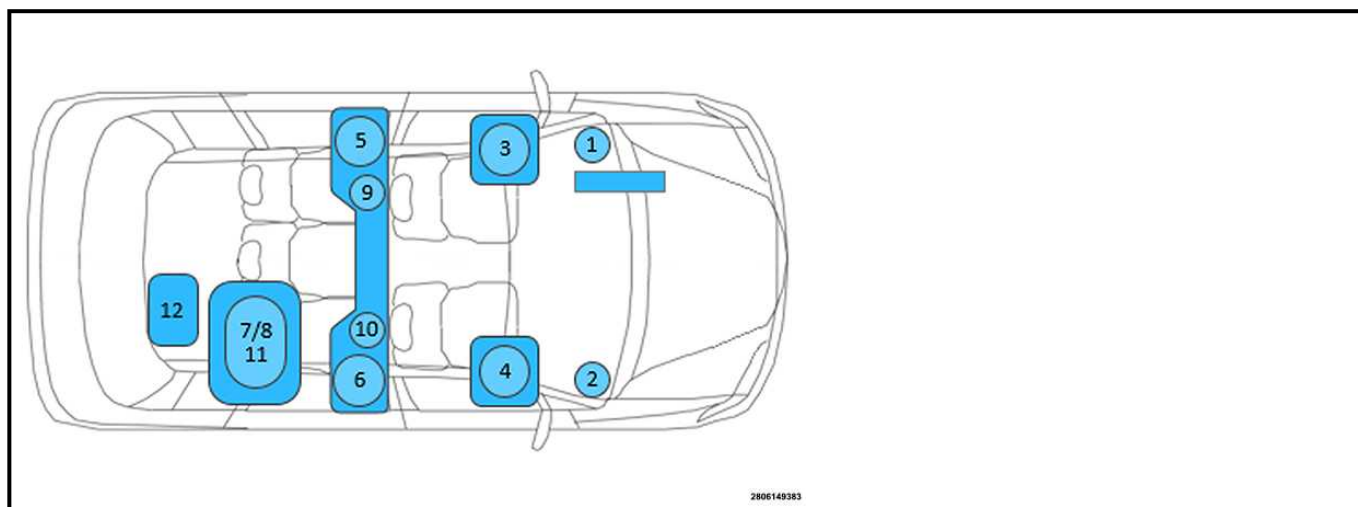
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X300	(+)
X390	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

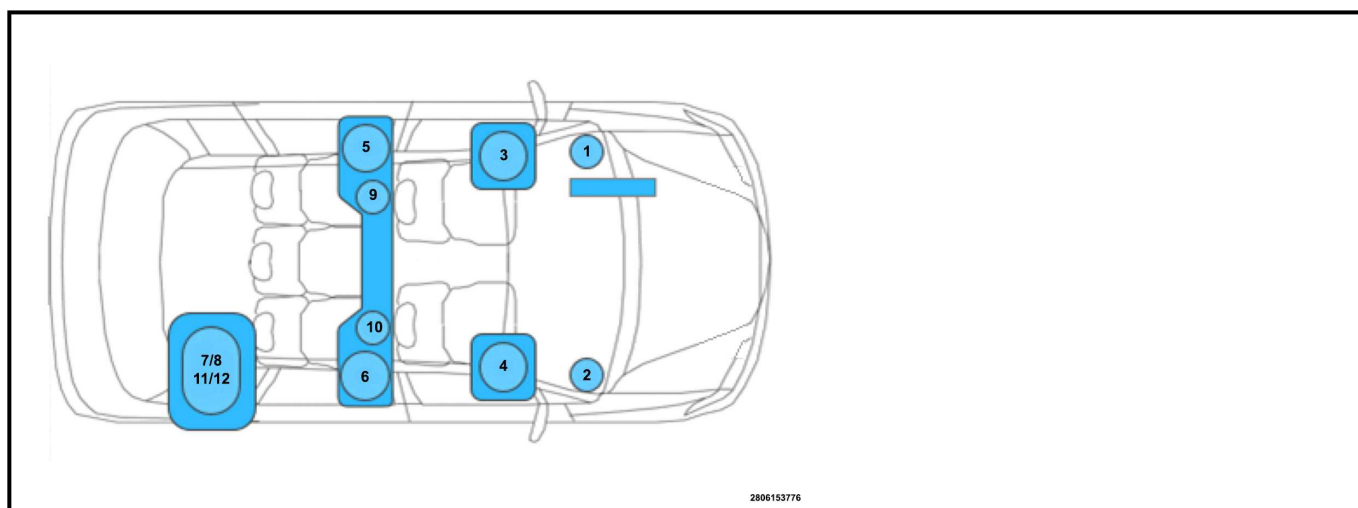
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

B147E-12-CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

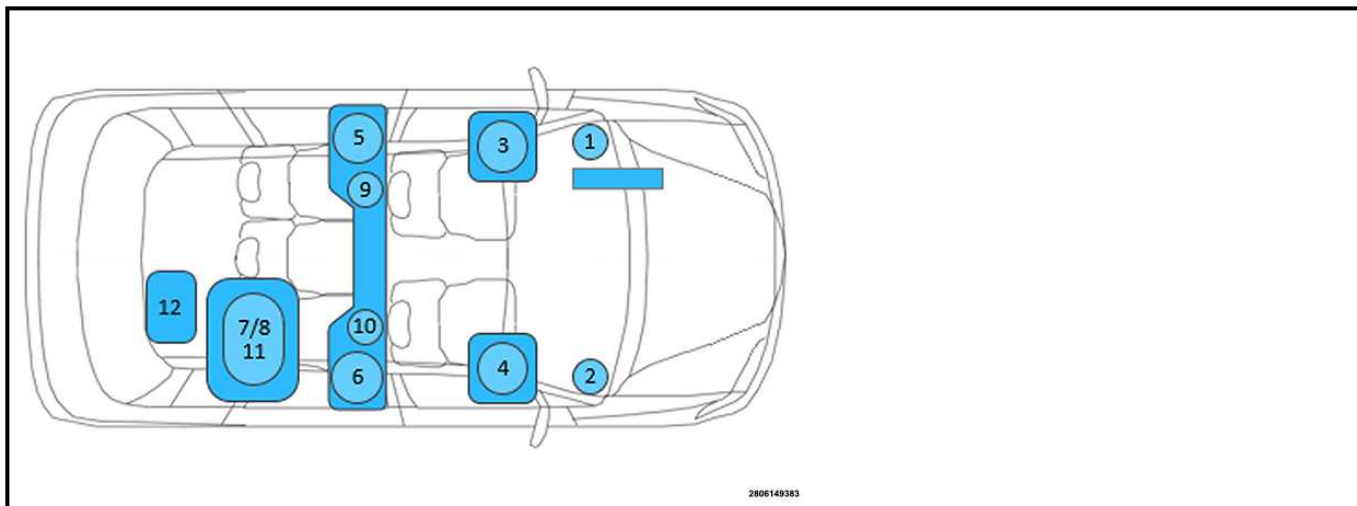
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X300	(+)
X390	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

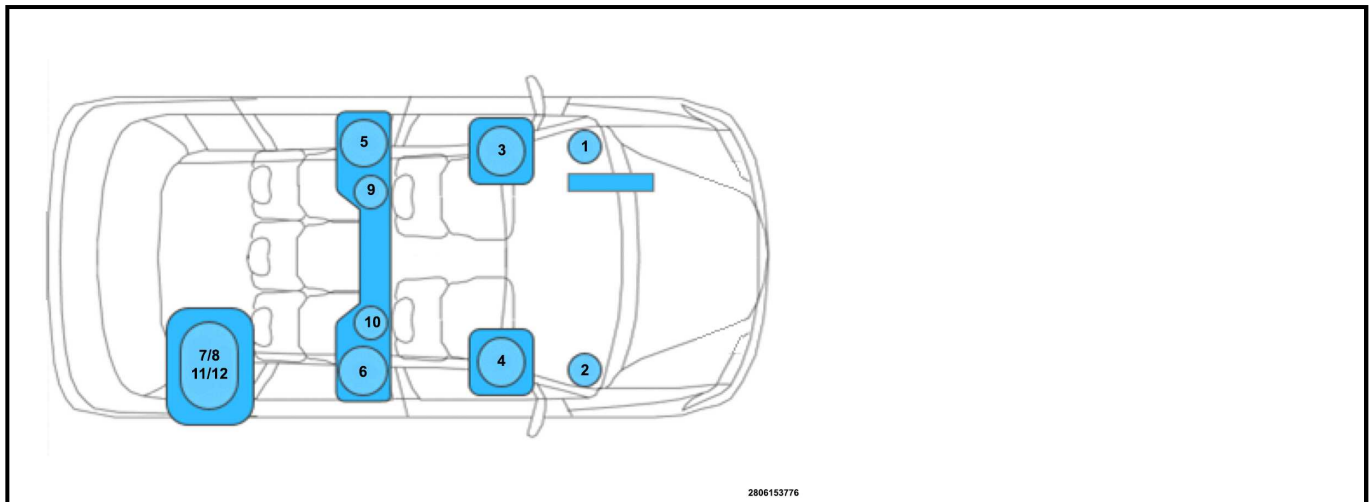
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B147E-13-CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

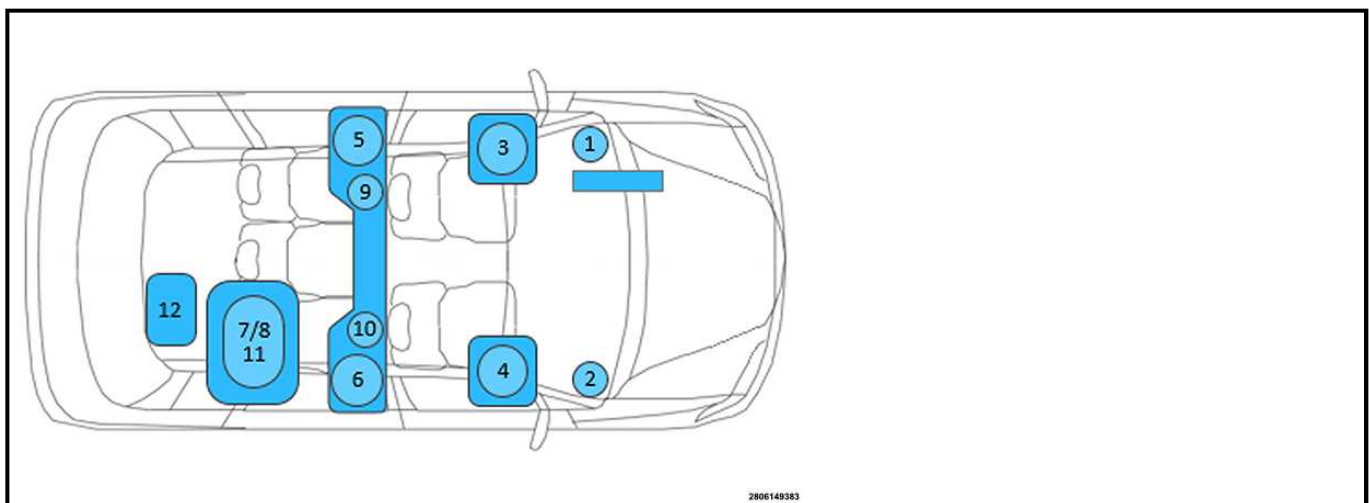
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X300	(+)
X390	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

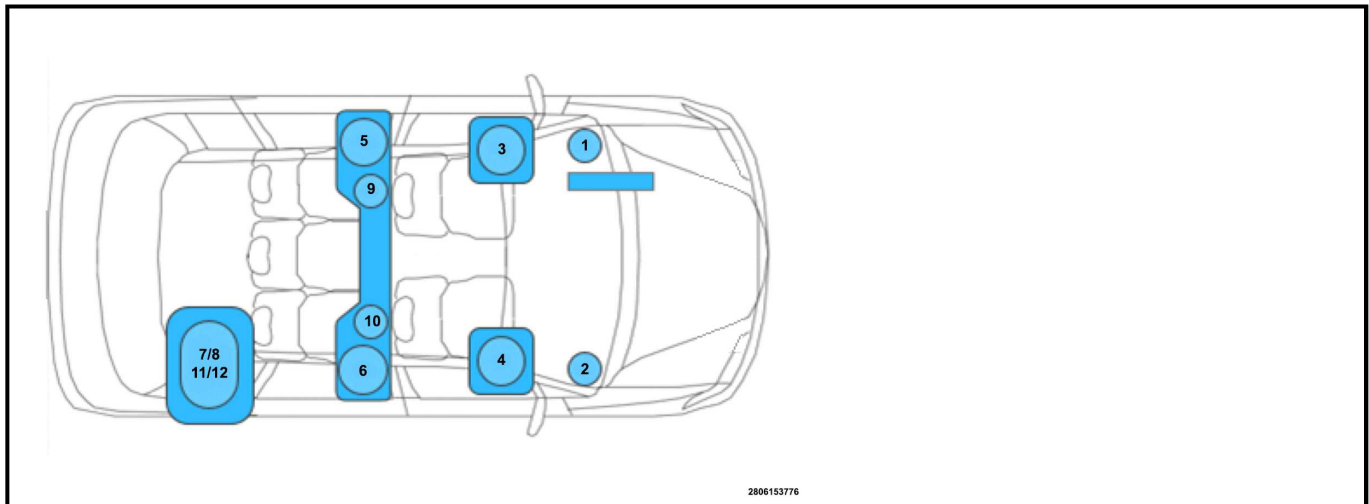
B147E-92-CHANNEL 7 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

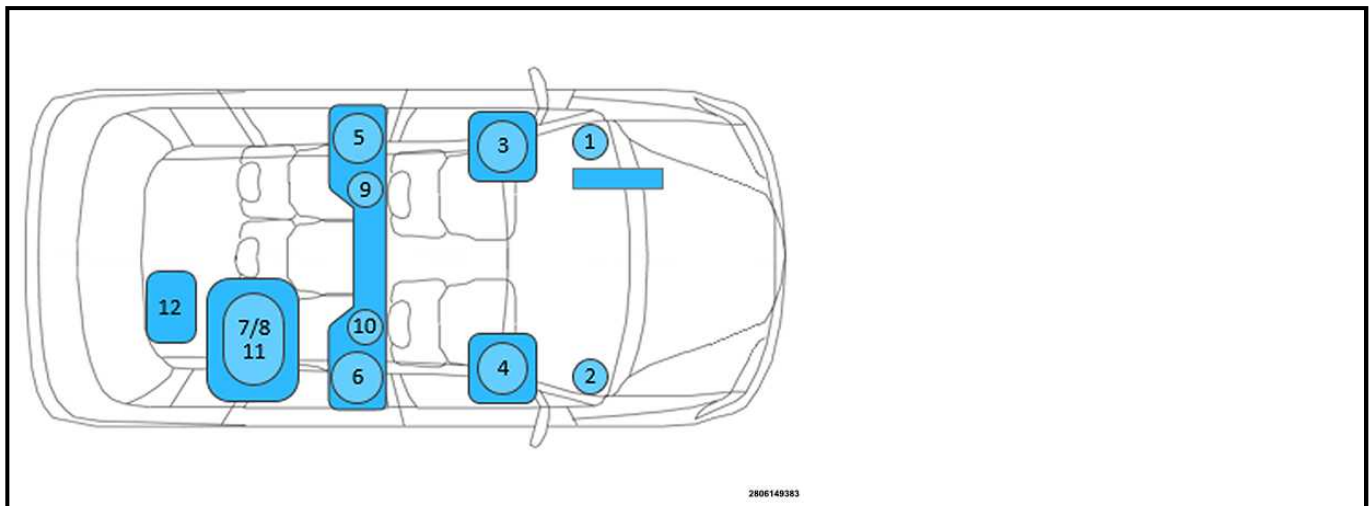
AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of**

Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

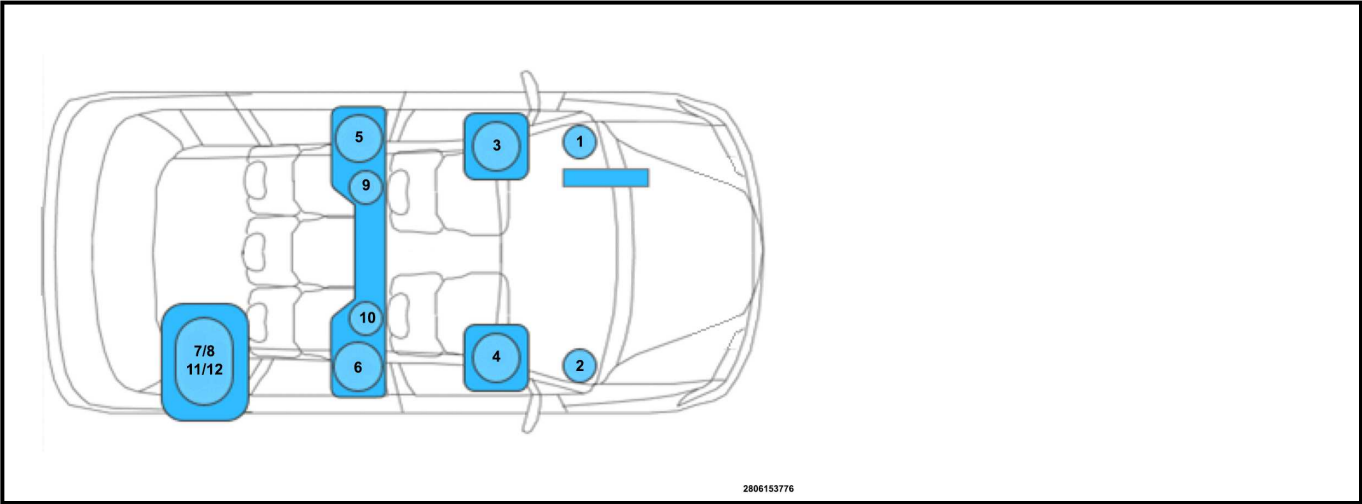
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B1482-00-CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

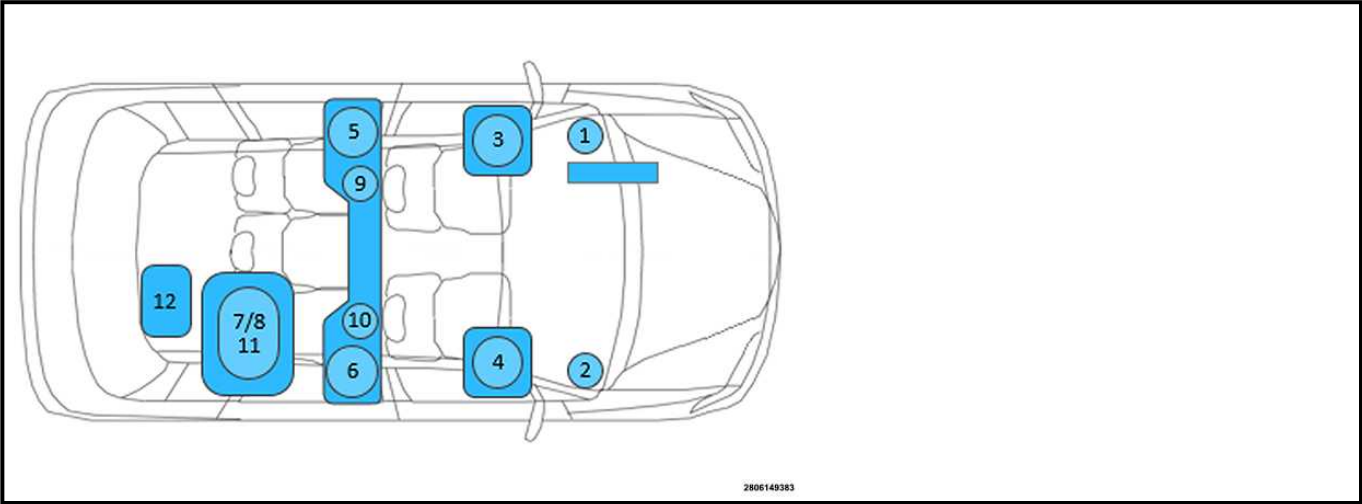
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information. .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X300	(+)
X390	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

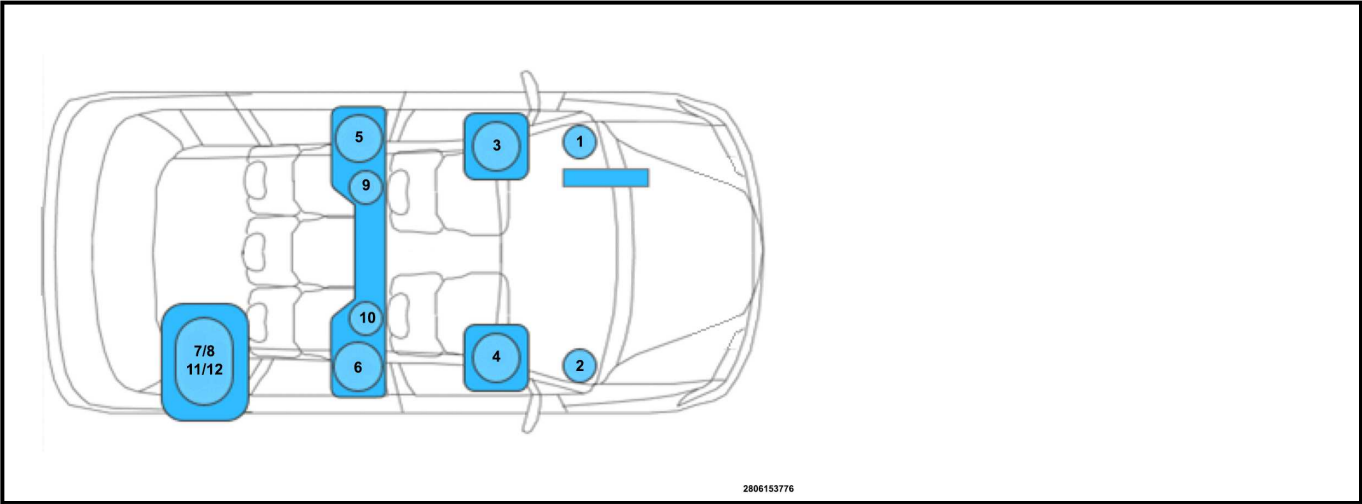
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1483-11-CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

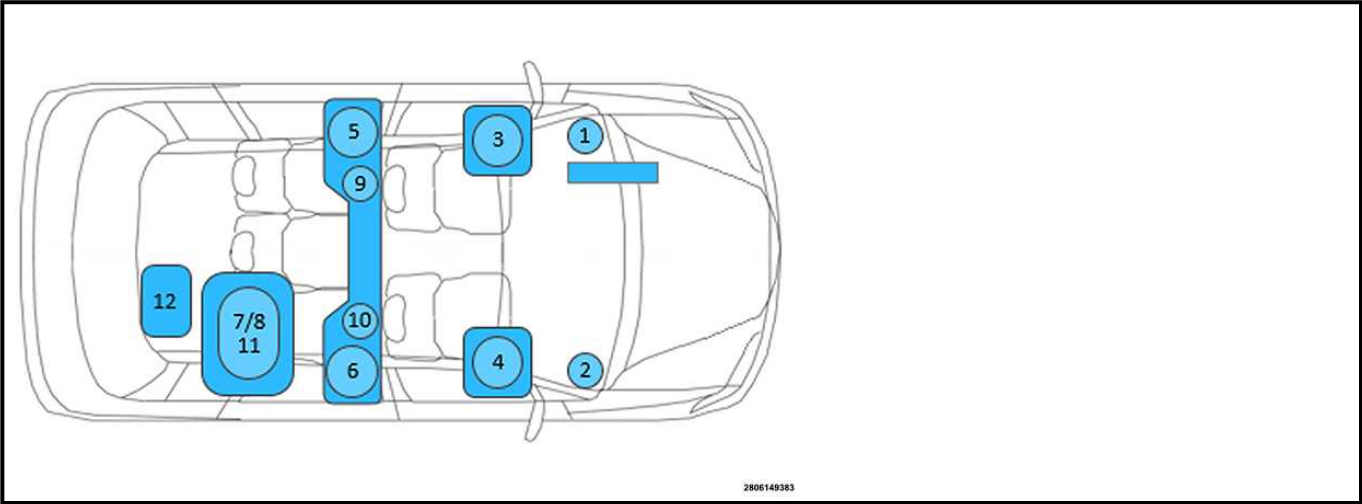
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X301	(+)
X391	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

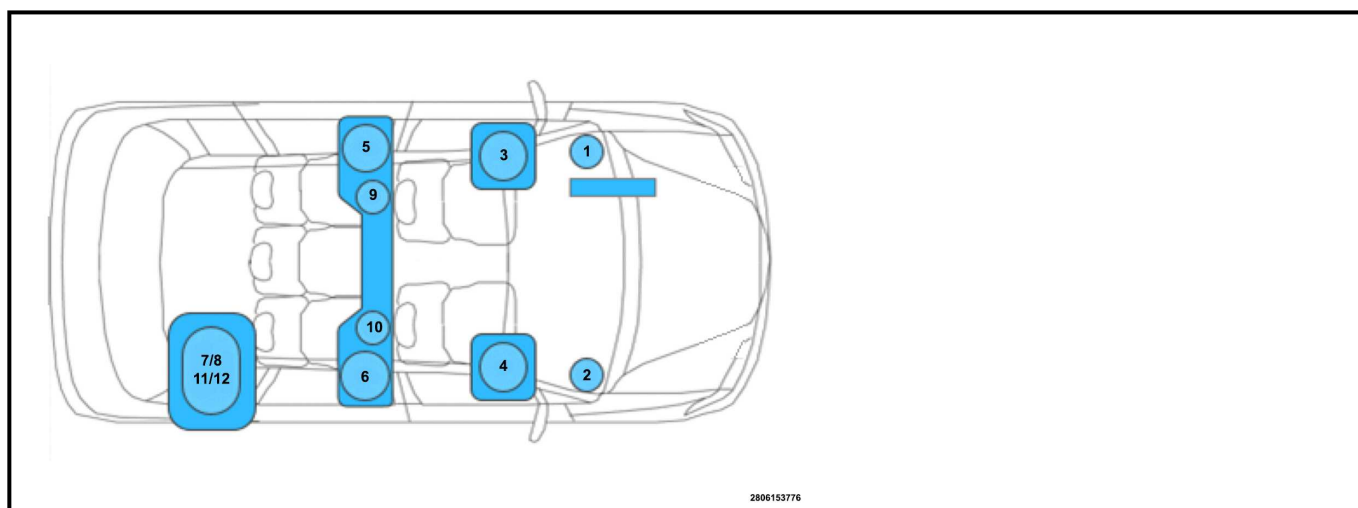
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1483-12-CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

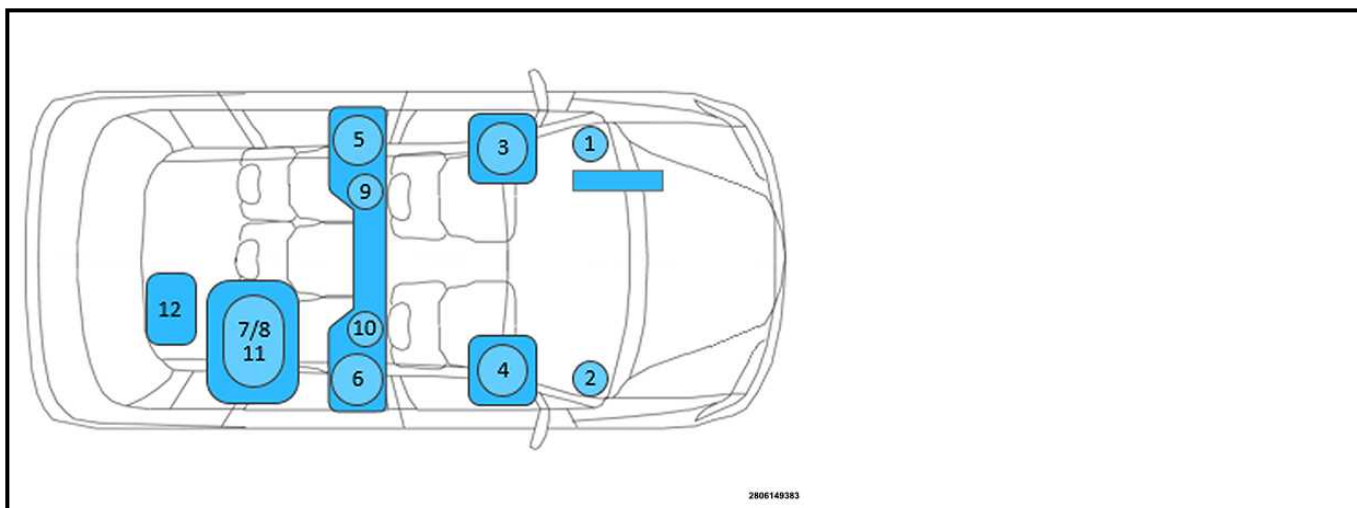
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X301	(+)
X391	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

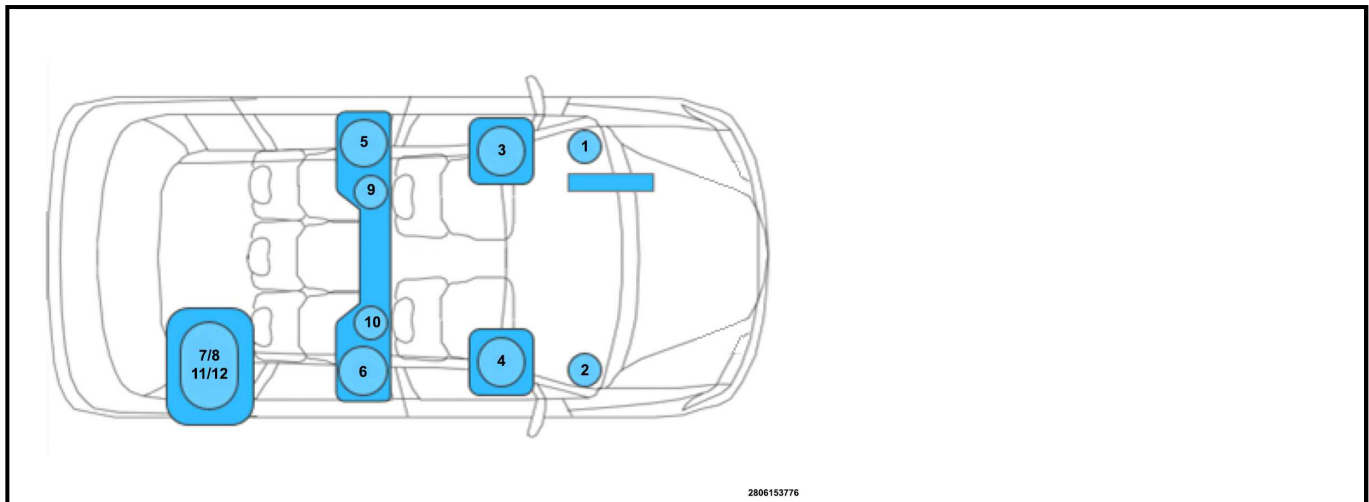
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1483-13-CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

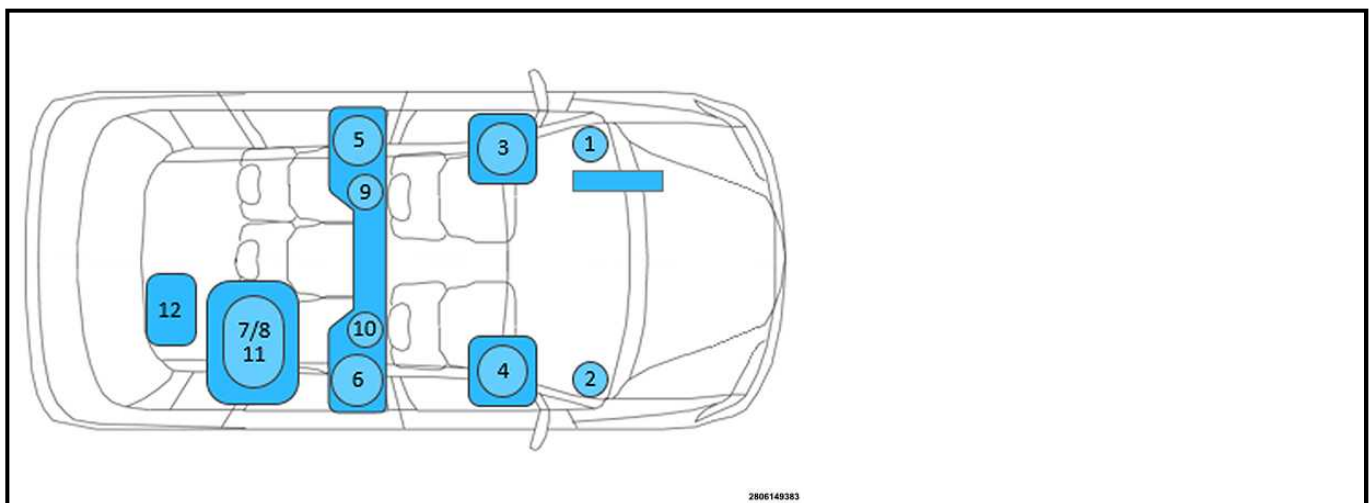
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X301	(+)
X391	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

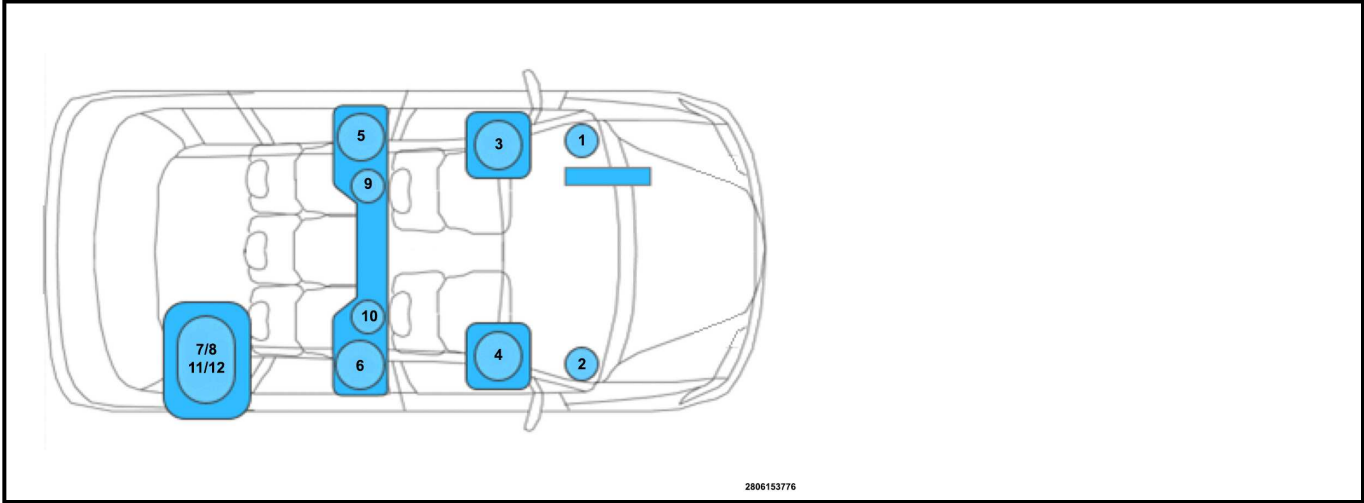
B1483-92-CHANNEL 8 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

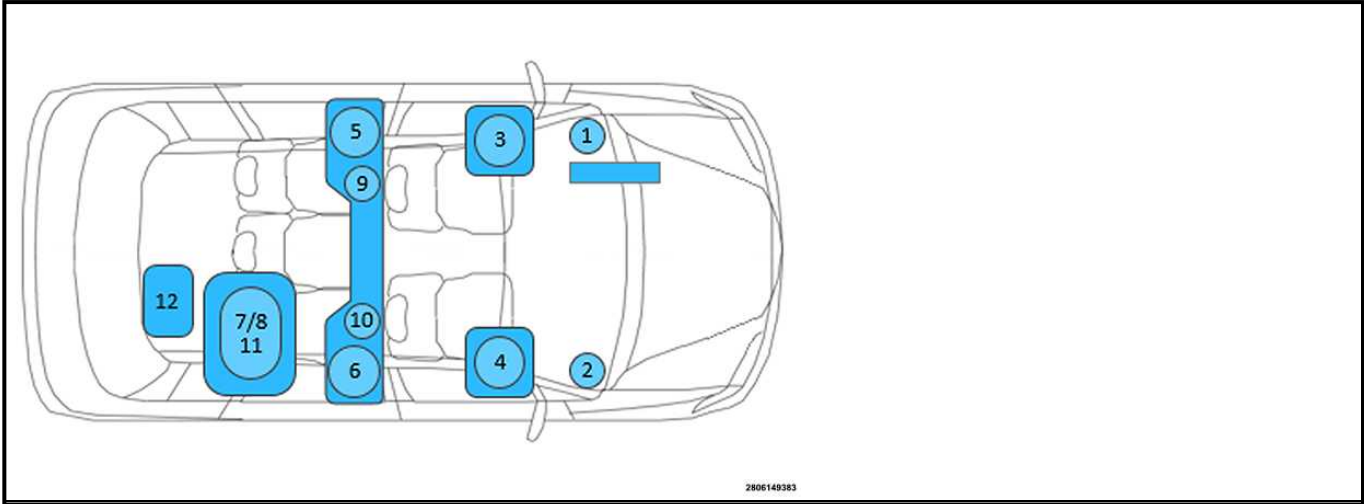
AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of**

Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This Diagnostic Trouble Code (DTC) sets if a Direct Current (DC) offset occurs on the output channel, when the ignition is cycled on. The Amplifier (AMP) shall set a DTC after a maturity rate of four to six seconds.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

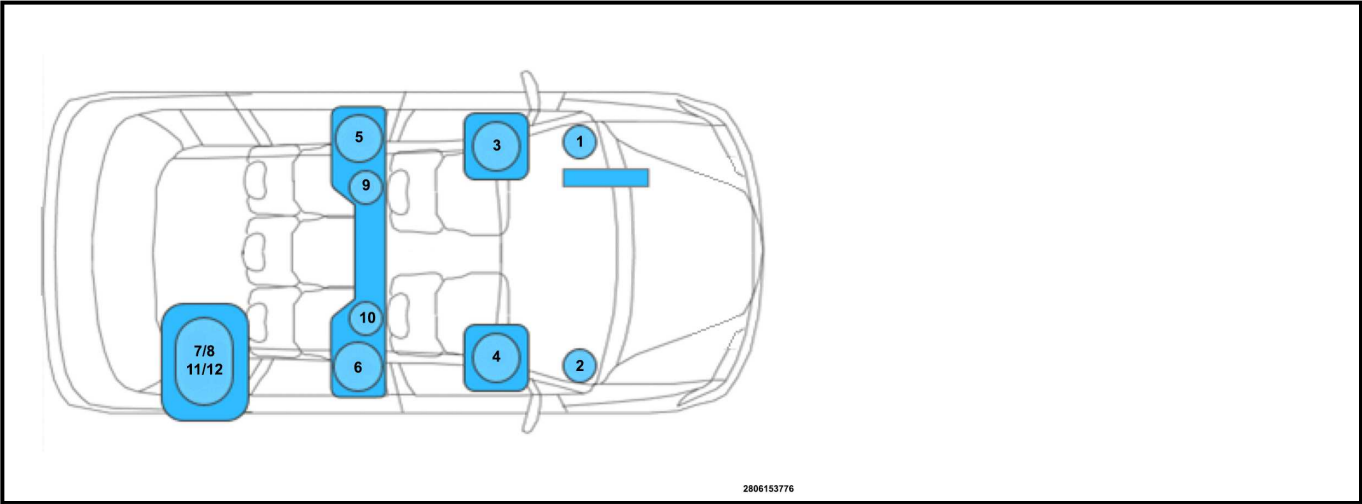
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B1487-00-CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

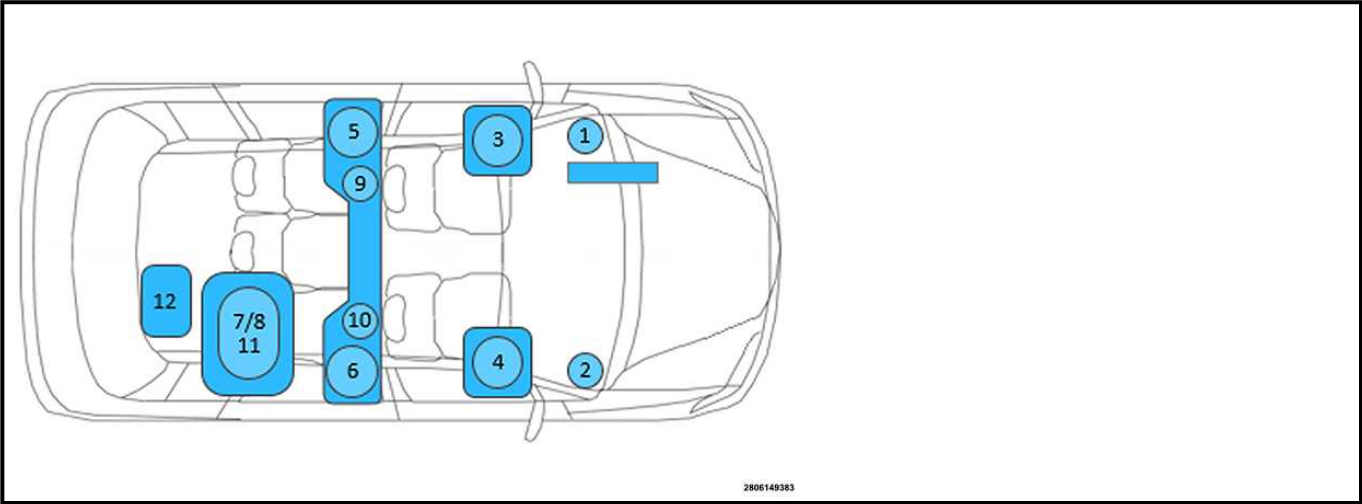
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, Refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects that the output circuits are shorted together.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X301	(+)
X391	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1488-00-CABIN EQ MISMATCH PERFORMANCE

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) will set this DTC when the Cabin Equalization Curve number message from the Body Control Module (BCM) is not the same as the Cabin Equalization Curve number stored in the AMP.

DEFAULT ACTION

- No audio.

POSSIBLE CAUSES

POSSIBLE CAUSES
NO COMMUNICATION WITH BCM
ACTIVE BCM DTCS
BCM
AMP

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. **NOTE: The Radio must be on.**

NOTE: A front door must remain open whenever checking or erasing Amplifier DTCS.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

4. With the scan tool, erase all DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

8. With the scan tool, read DTCS.

NOTE: **Make sure the Radio is turned on.**

NOTE: A front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE CABIN EQUALIZATION CURVE NUMBER

1. With the scan tool in the BCM ECU Details Tab, Configuration button, record the Cabin Equalization Curve number.
2. With the scan tool in the AMP ECU Details Tab, Configuration button, record the True value.

NOTE: The Cabin EQ Curve value found in the BCM should match the True value found in the AMP.

Do the Cabin EQ settings match one another?

Yes

- Replace the Amplifier in accordance to the service information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. VERIFY COMMUNICATION WITH BCM

1. With the scan tool, read the active modules on the BUS.

Does the scan tool show the BCM active on the BUS?

Yes

- Go To [4](#)

No

- Perform the No Response From ECU diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#) .

4. CHECK BCM FOR ACTIVE DTCs

1. With the scan tool, erase BCM DTCs.
2. Turn the ignition off. Wait approximately 10 seconds.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs and record on the repair order.

Are any active DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#) .

No

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

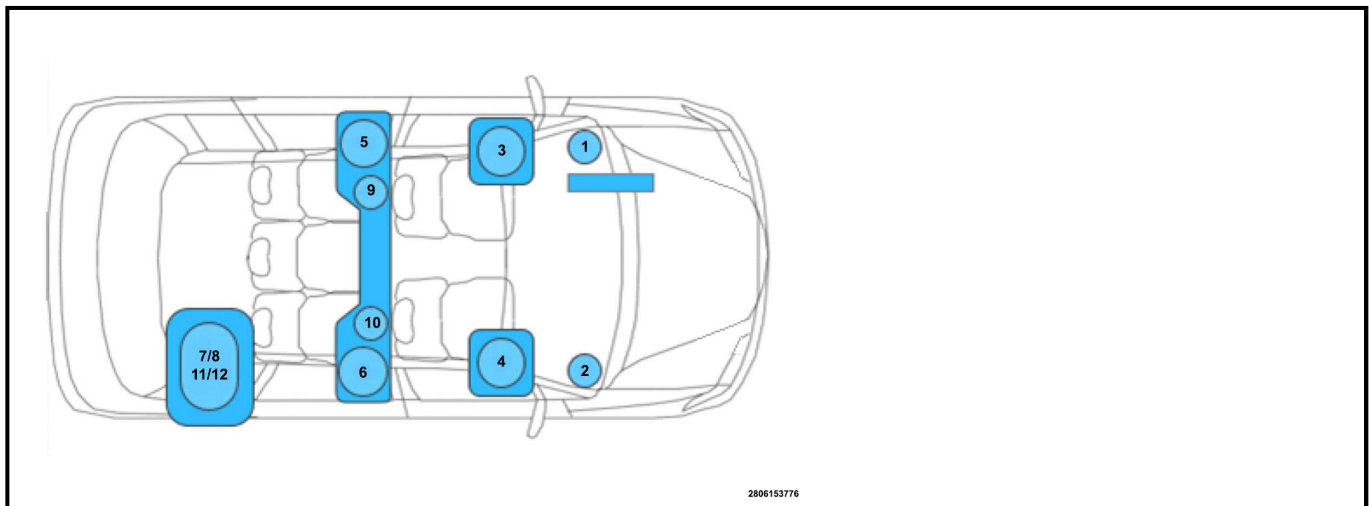
B14B9-11-CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

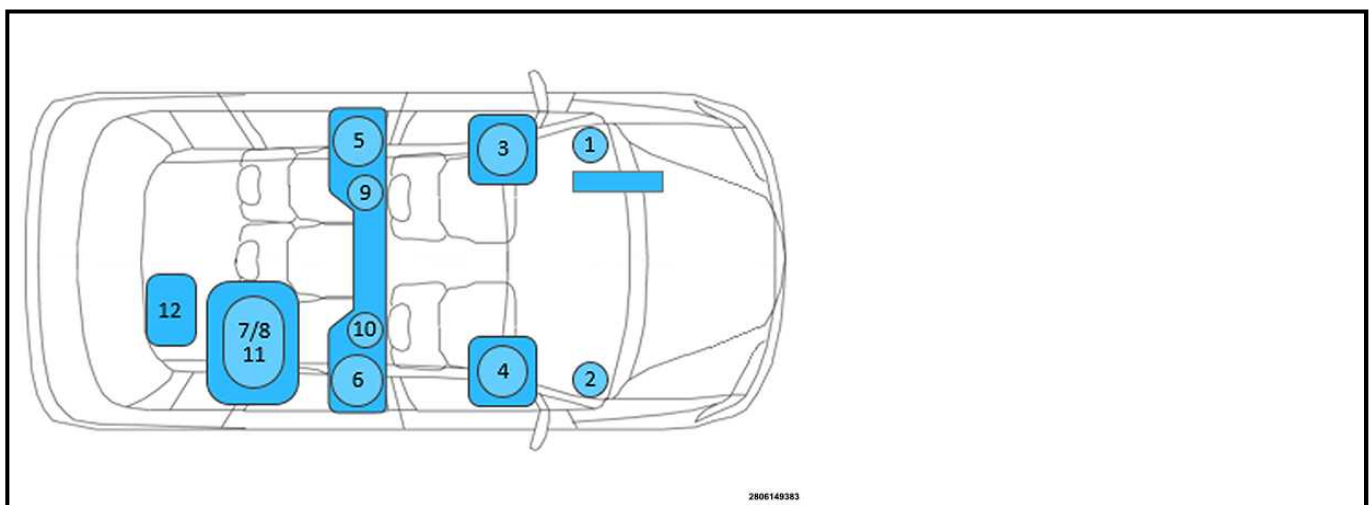
AUDIO CHANNEL MAPPING

NOTE:

Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a shorted to ground condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X214	(+)
X284	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. Turn the ignition on.
6. Turn the Radio on.
7. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

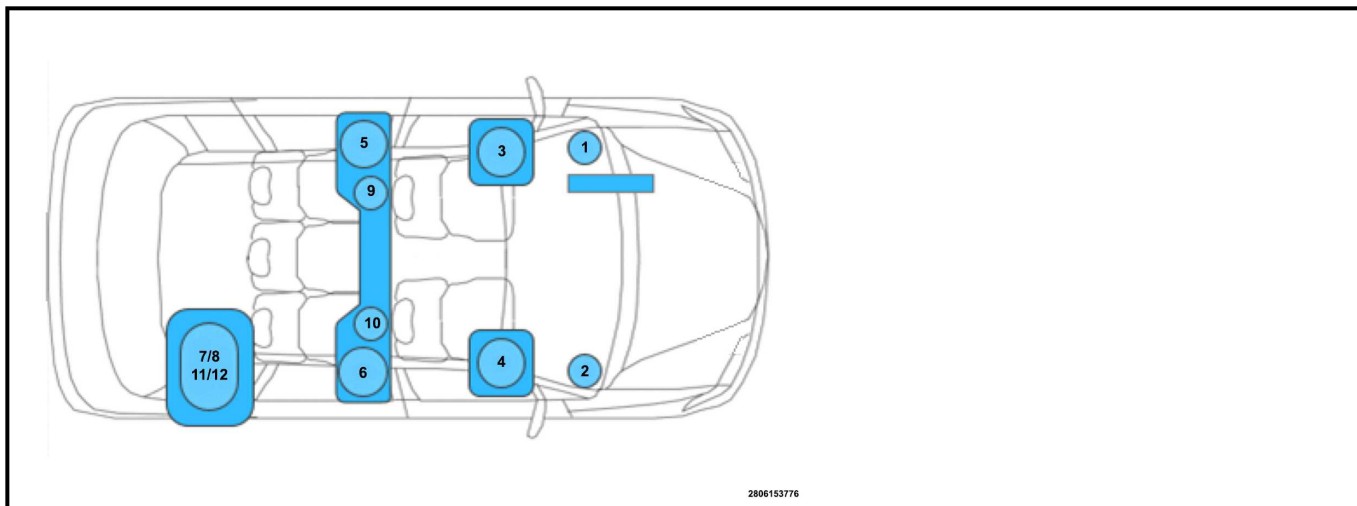
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B14B9-12-CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY

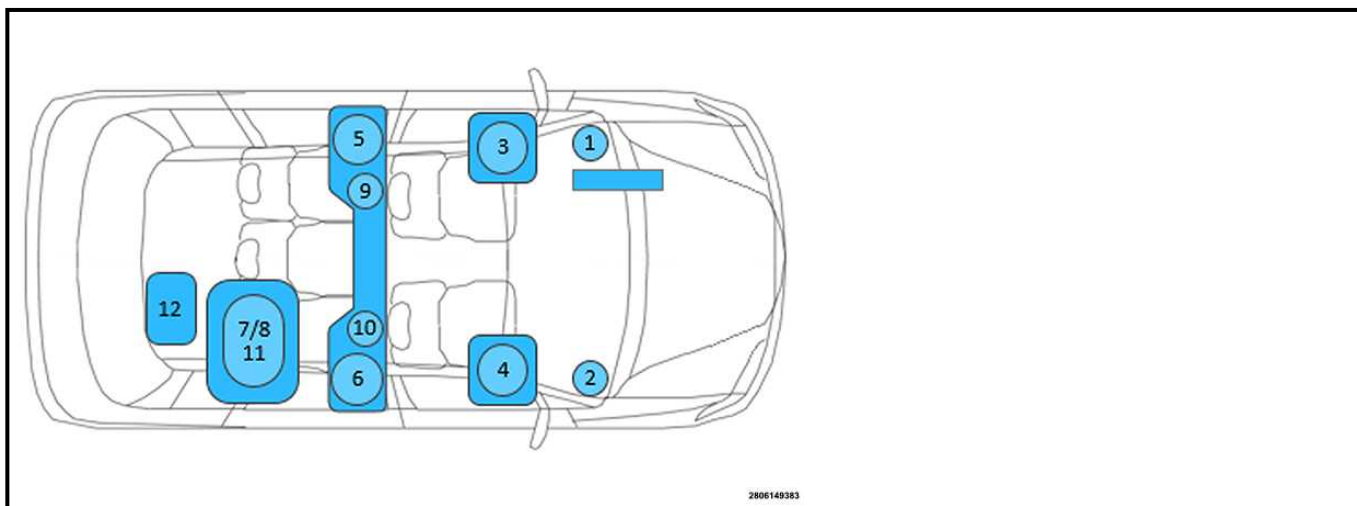
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects a short to battery condition on the speaker output circuit.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X214	(+)
X284	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

4. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to [**AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

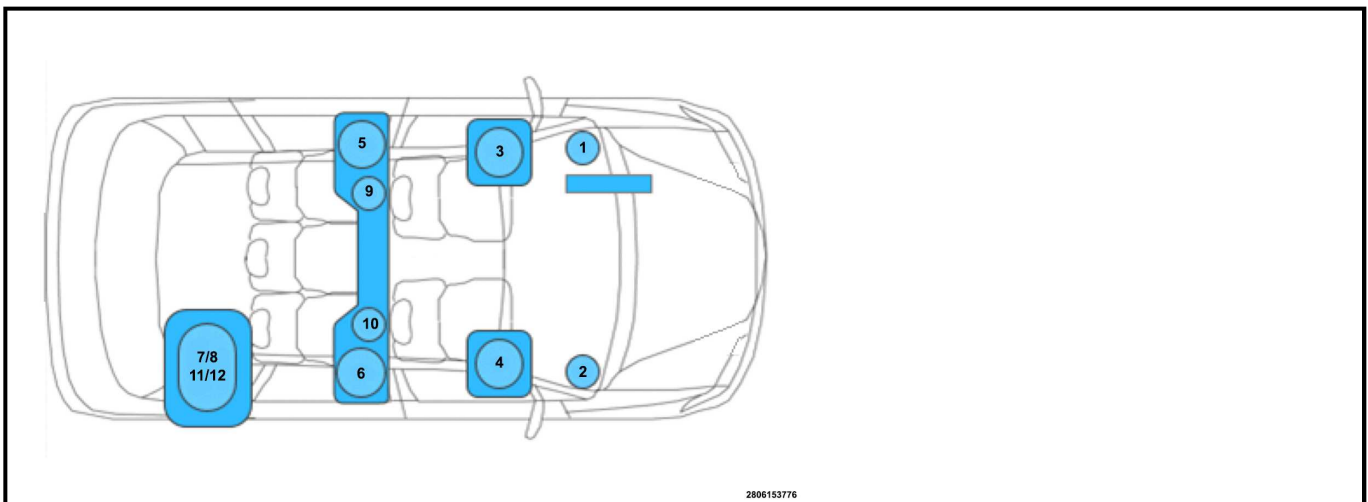
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B14B9-13-CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN

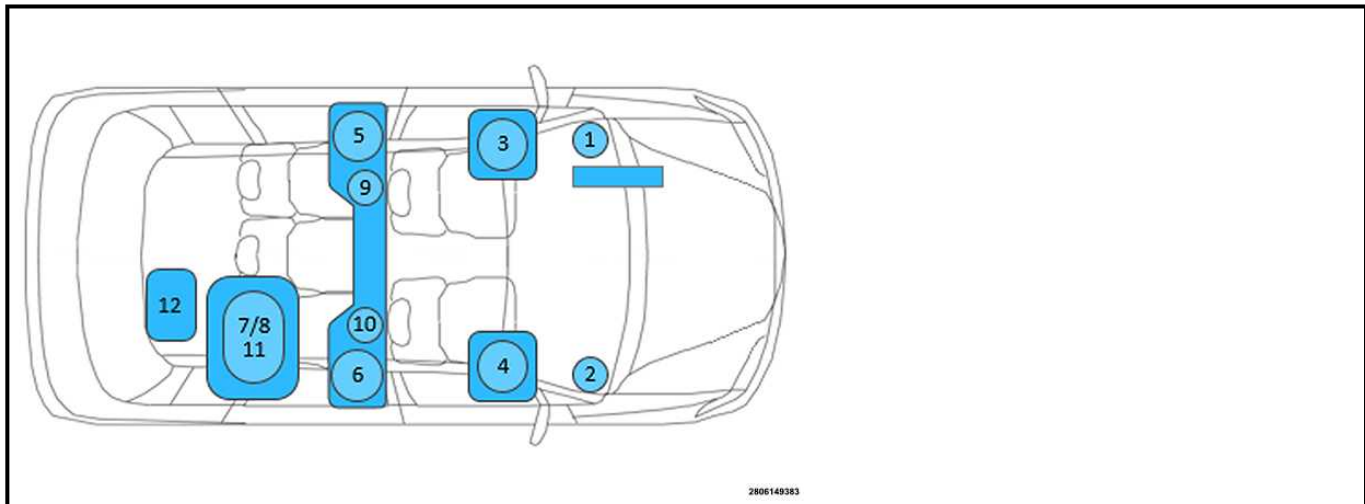
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **Refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Amplifier has a constant fused B+ feed and ground to the module. When an ignition on command is sent over the CAN bus, the Amplifier will wake up and turn on.

The Amplifier receives the audio signal circuits from the radio's front right and left, and rear right and left audio inputs and then converts the signals to amplified audio signals to corresponding speakers. The Amplifier monitors the speaker output feeds for any speaker concerns, wiring opens or shorts.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Amplifier (AMP) detects an open condition on the speaker output circuits.

DEFAULT ACTION

- The Amplifiers power integrated circuit automatically shuts down the individual channel speaker output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
SPEAKER SPEAKER (+/-) CIRCUIT OPEN AMPLIFIER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Speaker Circuits

Circuit ID	Circuit Description
X214	(+)
X284	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any

possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Amplifier harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Amplifier harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Amplifier DTCs.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Amplifier DTCs.

Did the DTC return?

Yes

- Replace the Amplifier in accordance with the Service information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
 - Test complete.
-

2021 ACCESSORIES AND EQUIPMENT

Amplifier (AMP) - Electrical Diagnostics - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1460-11</u>	CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B1460-12</u>	CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B1460-13</u>	CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B1460-92</u>	CHANNEL 1 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B1464-00</u>	CHANNEL 1 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B1465-11</u>	CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B1465-12</u>	CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B1465-13</u>	CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B1465-92</u>	CHANNEL 2 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B1469-00</u>	CHANNEL 2 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B146A-11</u>	CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B146A-12</u>	CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B146A-13</u>	CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B146A-92</u>	CHANNEL 3 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B146E-00</u>	CHANNEL 3 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B146F-11</u>	CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B146F-12</u>	CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B146F-13</u>	CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B146F-92</u>	CHANNEL 4 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B1473-00</u>	B1473-00 CHANNEL 4 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B1474-11</u>	CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B1474-12</u>	CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B1474-13</u>	CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B1474-92</u>	CHANNEL 5 AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION
<u>B1478-00</u>	CHANNEL 5 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B1479-11</u>	CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B1479-12</u>	CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B1479-13</u>	CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B1479-92</u>	CHANNEL 6 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B147D-00</u>	CHANNEL 6 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B147E-11</u>	CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B147E-12</u>	CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B147E-13</u>	CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B147E-92</u>	CHANNEL 7 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B1482-00</u>	CHANNEL 7 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER

DTC	Description
<u>B1483-11</u>	CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B1483-12</u>	CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B1483-13</u>	CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B1483-92</u>	CHANNEL 8 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B1487-00</u>	CHANNEL 8 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B1488-00</u>	CABIN EQ MISMATCH PERFORMANCE
<u>B14B9-11</u>	CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B14B9-12</u>	CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B14B9-13</u>	CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B14B9-2B</u>	CHANNEL 9 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B14B9-92</u>	CHANNEL 9 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B14BE-11</u>	CHANNEL 10 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B14BE-12</u>	CHANNEL 10 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B14BE-13</u>	CHANNEL 10 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B14BE-2B</u>	CHANNEL 10 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B14BE-92</u>	CHANNEL 10 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B14C3-11</u>	CHANNEL 11 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B14C3-12</u>	CHANNEL 11 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B14C3-13</u>	CHANNEL 11 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B14C3-2B</u>	CHANNEL 11 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B14C3-92</u>	CHANNEL 11 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B14C8-11</u>	CHANNEL 12 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO GROUND
<u>B14C8-12</u>	CHANNEL 12 AUDIO SPEAKER OUTPUT - CIRCUIT SHORT TO BATTERY
<u>B14C8-13</u>	CHANNEL 12 AUDIO SPEAKER OUTPUT - CIRCUIT OPEN
<u>B14C8-2B</u>	CHANNEL 12 AUDIO SPEAKER OUTPUT - CIRCUIT SHORTED TOGETHER
<u>B14C8-92</u>	CHANNEL 12 AUDIO SPEAKER OUTPUT - PERFORMANCE OR INCORRECT OPERATION
<u>B154F-00</u>	LOST CRANKSHAFT PULSE SIGNAL
<u>B2199-16</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B2199-17</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B21DD-84</u>	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
<u>B21DD-85</u>	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
<u>B2201-00</u>	CALIBRATION MISMATCH
<u>B221F-00</u>	AMPLIFIER INTERNAL
<u>B222C-00</u>	VEHICLE CONFIGURATION NOT PROGRAMMED
<u>U0010-00</u>	CAN INTERIOR BUS
<u>U0011-00</u>	CAN INTERIOR BUS OFF PERFORMANCE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0184-00</u>	LOST COMMUNICATION WITH RADIO
<u>U0199-00</u>	LOST COMMUNICATION WITH DRIVER DOOR MODULE
<u>U0200-00</u>	LOST COMMUNICATION WITH PASSENGER DOOR MODULE
<u>U0201-00</u>	LOST COMMUNICATION WITH LEFT REAR DOOR MODULE
<u>U0202-00</u>	LOST COMMUNICATION WITH RIGHT REAR DOOR MODULE
<u>U0206-00</u>	U0206-00 LOST COMMUNICATION WITH POWER TOP CONTROL MODULE

DTC	Description
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0485-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RADIO
<u>U049A-00</u>	IMPLAUSIBLE DATA RECEIVED FROM DRIVER DOOR MODULE
<u>U0501-00</u>	IMPLAUSIBLE DATA RECEIVED FROM PASSENGER DOOR MODULE
<u>U0506-00</u>	IMPLAUSIBLE DATA RECEIVED FROM LEFT REAR DOOR MODULE
<u>U050C-00</u>	U050C-00 IMPLAUSIBLE DATA RECEIVED FROM RIGHT REAR DOOR MODULE
<u>U11FB-00</u>	LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR
<u>U147E-00</u>	IMPLAUSIBLE DATA RECEIVED FROM LEFT BLIND SPOT SENSOR

2021 ACCESSORIES AND BODY, CAB

Audio (Radio) - Diagnostic Code Index - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1400-11</u>	FRONT LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND
<u>B1400-12</u>	FRONT LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY
<u>B1400-13</u>	FRONT LEFT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN
<u>B1400-1A</u>	FRONT LEFT AUDIO SPEAKER OUTPUT - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1400-92</u>	FRONT LEFT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION
<u>B1404-11</u>	FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND
<u>B1404-12</u>	FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY
<u>B1404-13</u>	FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN
<u>B1404-1A</u>	FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1404-92</u>	FRONT RIGHT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION
<u>B1408-11</u>	REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND
<u>B1408-12</u>	REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY
<u>B1408-13</u>	REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN
<u>B1408-1A</u>	REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1408-92</u>	REAR LEFT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION
<u>B140C-11</u>	REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND
<u>B140C-12</u>	REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY
<u>B140C-13</u>	REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN
<u>B140C-1A</u>	B140C-1A - REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B140C-92</u>	REAR RIGHT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION
<u>B142A-4B</u>	RADIO UNIT HIGH TEMPERATURE - OVER TEMPERATURE
<u>B1431-00</u>	BLUETOOTH ANTENNA INTERNAL PERFORMANCE
<u>B1434-13</u>	BLUETOOTH ANTENNA - CIRCUIT OPEN
<u>B1434-1A</u>	BLUETOOTH ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B143A-11</u>	MICROPHONE 1 - CIRCUIT SHORT TO GROUND
<u>B143A-12</u>	MICROPHONE 1 - CIRCUIT SHORT TO BATTERY
<u>B143A-13</u>	MICROPHONE 1 - CIRCUIT OPEN
<u>B143A-1A</u>	MICROPHONE 1 - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B143D-11</u>	B143D-11 - MICROPHONE 2-CIRCUIT SHORT TO GROUND
<u>B143D-12</u>	MICROPHONE 2 - CIRCUIT SHORT TO BATTERY
<u>B143D-13</u>	MICROPHONE 2 - CIRCUIT OPEN
<u>B143D-1A</u>	MICROPHONE 2 - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1488-00</u>	CABIN EQ MISMATCH PERFORMANCE
<u>B1494-00</u>	APP FAILED TO LOAD
<u>B1498-13</u>	USB HUB-CIRCUIT OPEN

DTC	Description
<u>B1498-19</u>	B1498-19 - USB HUB-OVERCURRENT
<u>B14DA-2A</u>	HEAD UNIT BUTTON - STUCK
<u>B1560-11</u>	CELLULAR ANTENNA 1-CIRCUIT SHORT TO GROUND
<u>B1560-13</u>	CELLULAR ANTENNA 1-CIRCUIT OPEN
<u>B1561-11</u>	CELLULAR ANTENNA 2-CIRCUIT SHORT TO GROUND
<u>B1561-13</u>	CELLULAR ANTENNA 2-CIRCUIT OPEN
<u>B1562-11</u>	GPS ANTENNA - CIRCUIT SHORT TO GROUND
<u>B1562-12</u>	B1562-12 GPS ANTENNA - CIRCUIT SHORT TO BATTERY
<u>B1562-13</u>	GPS ANTENNA - CIRCUIT OPEN
<u>B1562-1A</u>	GPS ANTENNA-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B156B-11</u>	B156B-11 SATELLITE RADIO ANTENNA-CIRCUIT SHORT TO GROUND
<u>B156B-12</u>	B156B-12 SATELLITE RADIO ANTENNA-CIRCUIT SHORT TO BATTERY
<u>B156B-13</u>	SATELLITE RADIO ANTENNA - CIRCUIT OPEN
<u>B156B-1A</u>	SATELLITE RADIO ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B156D-00</u>	LOW VOLTAGE DIFFERENTIAL SIGNAL (LVDS) VIDEO CABLE
<u>B156F-00</u>	WIFI ANTENNA
<u>B156F-1A</u>	WIFI ANTENNA-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1570-19</u>	USB COMMUNICATION - OVERCURRENT
<u>B1578-11</u>	B1578-11 - AUDIO ANTENNA - CIRCUIT SHORT TO GROUND
<u>B1578-12</u>	B1578-12 - AUDIO ANTENNA - CIRCUIT SHORT TO VOLTAGE
<u>B1578-13</u>	AM/FM ANTENNA - CIRCUIT OPEN
<u>B1578-1A</u>	AM/FM AUDIO ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1579-11</u>	B1579-11 DIVERSITY ANTENNA-CIRCUIT SHORT TO GROUND
<u>B1579-12</u>	B1579-12 DIVERSITY ANTENNA-CIRCUIT SHORT TO BATTERY
<u>B1579-13</u>	B1579-13 DIVERSITY ANTENNA - CIRCUIT OPEN
<u>B1579-1A</u>	B1579-1A DIVERSITY ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B157A-11</u>	B157A-11 DAB ANTENNA-CIRCUIT SHORT TO GROUND
<u>B157A-12</u>	B157A-12 DAB ANTENNA-CIRCUIT SHORT TO BATTERY
<u>B157A-13</u>	B157A-13 DAB ANTENNA - CIRCUIT OPEN
<u>B157A-1A</u>	B157A-1A DAB ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B157E-00</u>	TOUCH SCREEN LOCKED
<u>B210A-16</u>	SYSTEM VOLTAGE LOW - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B210B-17</u>	SYSTEM VOLTAGE HIGH-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B217A-87</u>	B217A-87 REAR CAMERA-MISSING MESSAGE
<u>B217A-9A</u>	B217A-9A REAR CAMERA-COMPONENT OR SYSTEM OPERATING CONDITIONS
<u>B2206-00</u>	CURRENT VIN MISSING/MISMATCH
<u>B221E-00</u>	RADIO INTERNAL
<u>B222C-00</u>	VEHICLE CONFIGURATION NOT PROGRAMMED
<u>B223B-00</u>	VEHICLE CONFIGURATION MISMATCH
<u>B2299-00</u>	REAR CAMERA MODULE INTERNAL
<u>B22AB-23</u>	B22AB-23 LIN STEERING WHEEL SWITCHES - SIGNAL STUCK LOW
<u>B280B-00</u>	REAR CAMERA VIDEO INPUT
<u>C221C-00</u>	ECU FLASH REQUIRED
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0010-00</u>	CAN INTERIOR BUS
<u>U0011-00</u>	CAN INTERIOR BUS OFF PERFORMANCE

DTC	Description
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0143-00</u>	LOST COMMUNICATION WITH MULTI-PURPOSE MODULE (VEHICLE SYSTEM INTERFACE MODULE-VSIM)
<u>U0151-00</u>	LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)
<u>U0155-00</u>	LOST COMMUNICATION WITH CLUSTER-CCN
<u>U0164-00</u>	LOST COMMUNICATION WITH HVAC CONTROL MODULE
<u>U0186-00</u>	LOST COMMUNICATION WITH AUDIO AMPLIFIER
<u>U0187-00</u>	U0187-00 - LOST COMMUNICATION WITH DVD PLAYER
<u>U0191-00</u>	LOST COMMUNICATION WITH DIGITAL TELEVISION MODULE
<u>U0196-00</u>	LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE - REAR 1
<u>U0199-00</u>	LOST COMMUNICATION WITH DRIVER DOOR MODULE
<u>U0200-00</u>	LOST COMMUNICATION WITH PASSENGER DOOR MODULE
<u>U0206-00</u>	U0206-00 LOST COMMUNICATION WITH POWER TOP CONTROL MODULE
<u>U0208-00</u>	U0208-00 LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE
<u>U0209-00</u>	LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE
<u>U0230-00</u>	LOST COMMUNICATION WITH POWER LIFTGATE MODULE
<u>U0232-00</u>	U0232-00 LOST COMMUNICATION WITH BLIND SPOT DETECTION MODULE
<u>U0249-00</u>	LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE - REAR 2
<u>U0264-00</u>	LOST COMMUNICATION WITH CAMERA MODULE-REAR
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0424-00</u>	IMPLAUSIBLE DATA RECEIVED FROM HVAC CONTROL MODULE
<u>U0487-00</u>	IMPLAUSIBLE DATA RECEIVED FROM AUDIO AMPLIFIER
<u>U0531-00</u>	U0531-00 IMPLAUSIBLE DATA RECEIVED FROM POWER LIFTGATE MODULE
<u>U1176-00</u>	LOST COMMUNICATION WITH EMERGENCY ALERT MODULE
<u>U11B8-00</u>	U11B8-00 LOST COMMUNICATION WITH INTEGRATED CENTER STACK (ICS)
<u>U11BB-00</u>	LOST COMMUNICATION WITH VIDEO ROUTING MODULE
<u>U11FA-00</u>	LOST COMMUNICATION WITH RIGHT BLIND SPOT SENSOR
<u>U11FB-00</u>	LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR
<u>U120E-00</u>	LOST COMMUNICATION WITH COMFORT SEAT AND WHEEL MODULE
<u>U1215-00</u>	LOST COMMUNICATION WITH FORWARD FACING CAMERA
<u>U12A7-00</u>	LOST COMMUNICATION WITH DISPLAY SCREEN MODULE
<u>U12AE-00</u>	U12AE-00 LOST COMMUNICATION WITH CENTRAL VISION PROCESSING MODULE
<u>U1430-00</u>	IMPLAUSIBLE DATA RECEIVED FROM COMFORT SEAT AND WHEEL MODULE
<u>U1445-00</u>	IMPLAUSIBLE DATA RECEIVED FROM DISPLAY SCREEN MODULE
<u>U1480-00</u>	IMPLAUSIBLE DATA RECEIVED FROM INTEGRATED CENTER STACK
<u>U147D-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RIGHT BLIND SPOT SENSOR

DTC	Description
<u>U147E-00</u>	IMPLAUSIBLE DATA RECEIVED FROM LEFT BLIND SPOT SENSOR
<u>U1519-00</u>	IMPLAUSIBLE DATA RECEIVED FROM VIDEO ROUTING MODULE

2021 ACCESSORIES AND EQUIPMENT

Audio (Radio) - DTCS B157A-11 To U1519-00 - Gladiator

DIAGNOSIS AND TESTING

B157A-11 DAB ANTENNA-CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

SET CONDITION

DEFAULT ACTION

- Poor or no reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION DAB ANTENNA CABLE DAB ANTENNA MODULE DAB ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA AND MODULE INSPECTION

NOTE: **The Digital Audio Broadcasting Antenna is service with the windshield.**

1. Visually inspect the DAB Antenna/DAB Module for damage.

Is the DAB Antenna/DAB Module missing or damaged?

Yes

- Replace the DAB Antenna/DAB Module in accordance with the Service Information. Refer to **MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the DAB Antenna Module is torqued to specification.

Were the antenna connections clean and module torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE DAB ANTENNA MODULE CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the DAB Antenna connection on the back of the Radio and to the vehicle DAB Antenna module.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the DAB Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DAB ANTENNA MODULE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna module in accordance with Service Information. Refer to **MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION** .
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [6](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DAB ANTENNA

NOTE: The Digital Audio Broadcasting Antenna is service with the windshield.

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna in accordance with Service Information.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B157A-12 DAB ANTENNA-CIRCUIT SHORT TO BATTERY

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

SET CONDITION

DEFAULT ACTION

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
DAB ANTENNA CABLE
DAB ANTENNA MODULE
DAB ANTENNA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA AND MODULE INSPECTION

NOTE: **The Digital Audio Broadcasting Antenna is service with the windshield.**

1. Visually inspect the DAB Antenna/DAB Module for damage.

Is the DAB Antenna/DAB Module missing or damaged?

Yes

- Replace the DAB Antenna/DAB Module in accordance with the Service Information. Refer to **MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the DAB Antenna Module is torqued to specification.

Were the antenna connections clean and module torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE DAB ANTENNA MODULE CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the DAB Antenna connection on the back of the Radio and to the vehicle DAB Antenna module.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the DAB Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DAB ANTENNA MODULE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna module in accordance with Service Information. Refer to **MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION** .
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [6](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

6. DAB ANTENNA

NOTE: **The Digital Audio Broadcasting Antenna is service with the windshield.**

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna in accordance with Service Information.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [7](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

- Test complete.

B157A-13 DAB ANTENNA - CIRCUIT OPEN

NOTE: The Scan Tool may display the description name of this Diagnostic Trouble Code differently with the following below:

DIGITAL AUDIO BROADCASTING (DAB) ANTENNA - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio does not detect an Digital Audio Broadcasting (DAB) Antenna connection or does not receive a Radio station signal.

DEFAULT ACTION

- Limited or no reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
DAB ANTENNA CABLE
DAB ANTENNA MODULE
DAB ANTENNA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ANTENNA AND MODULE INSPECTION

NOTE: **The Digital Audio Broadcasting Antenna is service with the windshield.**

1. Visually inspect the DAB Antenna/DAB Module for damage.

Is the DAB Antenna/DAB Module missing or damaged?

Yes

- Replace the DAB Antenna/DAB Module in accordance with the Service Information. Refer to [MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the DAB Antenna Module is torqued to specification.

Were the antenna connections clean and module torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE DAB ANTENNA MODULE CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the DAB Antenna connection on the back of the Radio and to the vehicle DAB Antenna module.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the DAB Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DAB ANTENNA MODULE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna module in accordance with Service Information. Refer to **MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION** .
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DAB ANTENNA

NOTE: The Digital Audio Broadcasting Antenna is service with the windshield.

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna in accordance with Service Information.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B157A-1A DAB ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD

NOTE: The Scan Tool may display the description name of this Diagnostic Trouble Code differently with the following below:

DIGITAL AUDIO BROADCASTING (DAB) ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on
- Radio in SEEK mode

SET CONDITION

- The Radio detects that the Digital Audio Broadcasting (DAB) antenna circuit is shorted together.

DEFAULT ACTION

- Limited or no Radio reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION ANTENNA CABLE ANTENNA MODULE ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**
 4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.
 5. Turn the ignition off for a minimum of 10.0 seconds.
 6. Turn the ignition on.
 7. Turn the Radio on and set the volume to 25.
 8. Adjust the speakers to the front and center.
 9. With the scan tool, read the active Radio DTCS.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ANTENNA AND MODULE INSPECTION

NOTE: The Digital Audio Broadcasting Antenna is service with the windshield.

1. Visually inspect the DAB Antenna/DAB Module for damage.

Is the DAB Antenna/DAB Module missing or damaged?

Yes

- Replace the DAB Antenna/DAB Module in accordance with the Service Information. Refer to [MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the DAB Antenna Module is torqued to specification.

Were the antenna connections clean and module torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE DAB ANTENNA MODULE CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the DAB Antenna connection on the back of the Radio and to the vehicle DAB Antenna module.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.

5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the DAB Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DAB ANTENNA MODULE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna module in accordance with Service Information. Refer to **MODULE, DIGITAL AUDIO BROADCASTING ANTENNA, REMOVAL AND INSTALLATION** .
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [6](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

6. DAB ANTENNA

NOTE: **The Digital Audio Broadcasting Antenna is service with the windshield.**

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Replace the DAB Antenna in accordance with Service Information.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [7](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B157E-00-TOUCH SCREEN LOCKED

NOTE: The Scan Tool may display the description name of this Diagnostic Trouble Code differently with the following below:

TOUCH SCREEN LOCKED - NO SUBTYPE INFORMATION
--

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio active on the bus.

SET CONDITION

- The Radio detects a closed switch.

DEFAULT ACTION

- Push-button commands ignored by the radio.

POSSIBLE CAUSES

Possible Causes
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. VERIFY OPERATION OF THE SCREEN

NOTE: Before performing the diagnostic test, make sure that any part of the radio bezel is not contacting the radio screen.

1. With the scan tool, read Radio DTCs and record on the repair order.
2. Remove the radio bezel.
3. With the scan tool, erase the DTCs.
4. Wait 60 seconds.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service Information.

No

- Go to [3](#)

3. CHECK RADIO BEZEL

1. Reinstall the radio bezel.
2. With the scan tool, erase DTCs.
3. Wait 60 seconds.
4. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Radio bezel in accordance with the Service Information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Test complete.

B210A-16-SYSTEM VOLTAGE LOW - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- If the Radio detects that the battery voltage is less than 9.0 volts.

DEFAULT ACTION

- Radio inoperative.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM
RADIO BATTERY SUPPLY CIRCUIT
RADIO GROUND CIRCUIT
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE BATTERY VOLTAGE TO THE RADIO WITH THE SCAN TOOL

1. With the scan tool in Data Display, read the Radio battery voltage.

Is the battery voltage less than 9.0 volts?

Yes

- Go To [3](#)

No

- Replace the Radio in accordance with the Service Information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE BATTERY VOLTAGE TO THE RADIO

1. Disconnect the Radio C1 harness connector.

NOTE: Check the Radio harness connector for signs of corrosion, pushed out or bent terminals, and correct pin tension.

2. Measure the voltage between ground and the (A234) Fused B+ circuit at the Radio C1 harness connector.

Is the battery voltage less than 9.0 volts?

Yes

- Go To [4](#)

No

- Replace the Radio in accordance with the Service Information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK FOR CHARGING SYSTEM RELATED DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. With the scan tool in ECU View, select PCM and check for any Charging System related DTCS.

Does the scan tool display any Charging System related DTCS?

Yes

- Refer to [DIAGNOSIS AND TESTING](#) , or [DIAGNOSIS AND TESTING](#) and perform the appropriate charging system or battery DTC diagnostic procedure.

No

- Check for voltage drop concerns across the (A933) Fused B+ circuit and repair as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B210B-17-SYSTEM VOLTAGE HIGH-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- If the module detects that the battery voltage is greater than 17 volts.

DEFAULT ACTION

- Radio inoperative.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**
4. With the scan tool, record and erase the Radio DTCS.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCS.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM RELATED DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Verify the Battery is in good condition. and perform the Battery System diagnostic procedure. Refer to the appropriate information .
2. With the scan tool in ECU View, select PCM and check for any Charging System related DTCS.

Does the scan tool display any Charging System related DTCS?

Yes

- Refer to **DIAGNOSIS AND TESTING** , or **DIAGNOSIS AND TESTING** and perform the appropriate charging system or battery DTC diagnostic procedure.

No

- Replace the Radio in accordance with the Service Information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B217A-87 REAR CAMERA-MISSING MESSAGE

For a complete BACK UP CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects video connection with the Camera is not present.

DEFAULT ACTION

- Rear video image is blanked out on the video screen.

POSSIBLE CAUSES

Possible Causes
CAMERA WIRING REAR CAMERA RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. TEST THE REAR CAMERA

1. Turn the ignition off.
2. Disconnect the Rear Camera from the harness connector.
3. Disconnect a known good working Camera from a like vehicle with the same Audio/Video system configuration.
4. Connect the known good working Camera to this vehicle.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on and wait 25 seconds.
10. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Replace the Rear Camera in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. TEST THE REAR CAMERA CIRCUITS

1. Turn the ignition off.
2. Disconnect the coax cable/LVDS camera harness connector from the Radio.
3. Disconnect the known good working Camera from the vehicle harness connector.
4. Connect test tool cable kit (special tool #9977-6-8, Adapter, RG-174 Coax Cable) to the Radio and the known good Camera.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.

8. Turn the ignition on.
9. Turn the Radio on and wait 25 seconds.
10. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Rear Camera circuit(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service Information. Refer to **RADIO, REMOVAL AND INSTALLATION** .

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- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B217A-9A REAR CAMERA-COMPONENT OR SYSTEM OPERATING CONDITIONS

For a complete BACK UP CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects video connection with the Camera is not present.

DEFAULT ACTION

- Rear video image is blanked out on the video screen.

POSSIBLE CAUSES

Possible Causes
CAMERA WIRING
REAR CAMERA
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. TEST THE REAR CAMERA

1. Turn the ignition off.
2. Disconnect the Rear Camera from the harness connector.
3. Disconnect a known good working Camera from a like vehicle with the same Audio/Video system configuration.
4. Connect the known good working Camera to this vehicle.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on and wait 25 seconds.
10. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Replace the Rear Camera in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. TEST THE REAR CAMERA CIRCUITS

1. Turn the ignition off.
2. Disconnect the coax cable/LVDS camera harness connector from the Radio.
3. Disconnect the known good working Camera from the vehicle harness connector.

4. Connect test tool cable kit (special tool #9977-6-8, Adapter, RG-174 Coax Cable) to the Radio and the known good Camera.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on and wait 25 seconds.
10. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Rear Camera circuit(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.

12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service Information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#).
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).
- Test complete.

B2206-00-CURRENT VIN MISSING/MISMATCH

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Vehicle Identification Number (VIN) stored in the original position of the Radio does not match the current VIN broadcasted by the BCM over the Controller Area Network (CAN) bus.

DEFAULT ACTION

- Radio inoperative.
- Radio may request security code.

POSSIBLE CAUSES

Possible Causes
RADIO SWAPPED FROM DIFFERENT VEHICLE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Replace the radio in accordance with service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B221E-00-RADIO INTERNAL

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio on.

SET CONDITION

- The code will set if the Radio detects an internal failure.

DEFAULT ACTION

- Radio inoperative.

POSSIBLE CAUSES

Possible Causes
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service Information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

- If the engine is running.

SET CONDITION

- If the Radio detects no vehicle configuration from the Body Control Module (BCM).

DEFAULT ACTION

- Default system configuration used.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) VEHICLE CONFIGURATION RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
 4. With the scan tool, record and erase the Radio DTCs.
 5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
 6. Turn the Radio on and set the volume to 25.
 7. Adjust the speakers to the front and center.
 8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate **INTERMITTENT CONDITION** diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. PERFORM A RESTORE VEHICLE CONFIGURATION IN THE BCM

1. With the scan tool, perform the Restore Vehicle Configuration in the BCM.
2. With the scan tool, record and erase the Radio DTCs.
3. Cycle the ignition switch from on to off, wait five seconds and then back to on.
4. With the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Replace the Radio in accordance with the Service Information. Refer to [RADIO, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

B223B-00-VEHICLE CONFIGURATION MISMATCH

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- If the Radio detects the wrong vehicle configuration from the Body Control Module (BCM).

DEFAULT ACTION

- Limited or no audio output.
- Radio controls not responsive.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) VEHICLE CONFIGURATION RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**

NOTE: Diagnose and repair any BCM VIN or Communication DTCs before continuing with this test.

4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

NOTE: Diagnose and repair any BCM VIN or Communication DTCs before continuing with this test.

Did the DTC return?

Yes

- Go To [2](#)

No

- Use the scan tool to read DTCs in all other modules. If any communication DTCs are present, perform the appropriate diagnostic procedure. Perform any Technical Service Bulletins that apply. If no problems are found, test is complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

2. PERFORM A RESTORE VEHICLE CONFIGURATION IN THE BCM

1. With the scan tool, perform the Restore Vehicle Configuration in the BCM.
2. With the scan tool, record and erase the Radio DTCs.
3. Cycle the ignition switch from on to off, wait five seconds and then back to on.
4. With the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Replace the Radio in accordance with the Service Information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B2299-00-REAR CAMERA MODULE INTERNAL

For a complete BACK UP CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Radio detects an internal failure in the Rear View Camera Module.

DEFAULT ACTION

- The Rear View Camera Module is not fully operational.

POSSIBLE CAUSES

Possible Causes
CAMERA WIRING
REAR VIEW CAMERA MODULE
RADIO

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. TEST THE REAR CAMERA CIRCUITS

1. Turn the ignition off.
2. Disconnect the coax cable/LVDS camera harness connector from the Radio.
3. Disconnect the Camera from the vehicle harness connector.
4. Connect test tool cable kit (special tool #9977-6-8, Adapter, RG-174 Coax Cable) to the Radio and the Camera.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on and wait 25 seconds.
10. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Replace the Rear Camera circuit(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. TEST THE REAR CAMERA

1. Turn the ignition off.
2. Disconnect the Rear Camera from the harness connector.
3. Disconnect a known good working Camera from a vehicle.
4. Connect the known good working Camera to this vehicle.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on and wait 25 seconds.
10. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Rear Camera Module in accordance with the service information. Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B22AB-23 LIN STEERING WHEEL SWITCHES - SIGNAL STUCK LOW

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio on.

SET CONDITION

- The Radio detects a steering wheel switch stuck in the pressed position.

DEFAULT ACTION

- Steering wheel commands not operating correctly.

POSSIBLE CAUSES

Possible Causes
RADIO LIN BUS CIRCUIT REMOTE STEERING WHEEL SWITCHES STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio and SCCM, and then erase DTCs.

5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE STATUS OF THE REMOTE RADIO SWITCHES IN THE RADIO

1. Do not press either remote radio switch.
2. Hands off the Steering Wheel.
3. With the scan tool, monitor the "PRESSED/NOT PRESSED" status of the remote radio switches in the Radio data display.

Do any remote radio switch always show "PRESSED"?

Yes

- Go To [3](#)

No

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CONTINUE TO CHECK THE STATUS OF THE REMOTE RADIO SWITCHES IN THE RADIO

NOTE: **Do not press either remote radio switch.**

1. Start the engine and allow it to idle.
2. With the scan tool, continuously monitor the "PRESSED/NOT PRESSED" status of the remote radio switches in the Radio data display while performing the test in the following order:
 - Hands on the Steering Wheel turning slowly to full left, full right, and back to center.
 - Hands on the Steering Wheel apply slight straight ahead pressure while turning slowly to full left, full right, and back to center.
 - Hands on the Steering Wheel pulling back with slight pressure while turning slowly to full left, full right, and back to center.
 - If equipped, adjust the steering column up and down in all positions, and repeat the above process.
3. Turn the engine off.

Did the remote radio switch status change during testing?

Yes

- Go To [4](#)

No

- Go To [7](#)

4. CHECK THE (D594) LIN BUS CIRCUIT

1. The ignition must be off when checking the circuit for damage.
2. Using the appropriate wiring diagram, isolate the LIN Bus circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Inspect the LIN Bus circuit for chafed, pierced, pinched, or partially broken wires.
4. Inspect the LIN Bus connectors and terminals for broken, bent, pushed out, spread, corroded, contaminated or the presence of foreign conductive materials on connector pins and terminals.

Was any visual damage found to the LIN Bus circuit?

Yes

- Repair the damaged circuit as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D594) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (D594) LIN BUS CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE SCCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors

connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.

4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE REMOTE RADIO SWITCHES

1. The ignition must be off.
2. Remove the remote radio switches from the steering wheel. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#).
3. Use an ohmmeter to check the switch resistances as shown in the Remote Radio Switch Test chart.

REMOTE RADIO SWITCH TEST				
Switch	Switch Position	Minimum Resistance (kilohms)	Nominal Resistance (kilohms)	Maximum Resistance (kilohms)
Right	Volume Up	6.732	6.8	6.868
Right	Volume Down	14.850	15	15.151
Right	Mode Advance	0	0	0
Left	Seek Up	1.188	1.2	1.212
Left	Seek Down	3.267	3.3	3.333
Left	Pre-Set Station Advance	0.465	0.47	0.474

Are the remote radio switch resistances in specifications?

Yes

- Go To [8](#)

No

- Replace the Remote Radio Switches in accordance with Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Steering Column Control Module (SCCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and SCCM, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the SCCM in accordance with the Service information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B280B-00-REAR CAMERA VIDEO INPUT

For a complete BACK UP CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition

switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio detects a open or short on the Low Voltage Digital Signal (LVDS) Camera circuits.

DEFAULT ACTION

- Camera inoperative.

POSSIBLE CAUSES

Possible Causes
LVDS CAMERA CIRCUITS DAMAGED
BACKUP CAMERA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.

8. Adjust the speakers to the front and center.

9. With the scan tool, read the active Radio DTCS.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE LVDS CABLE BETWEEN THE RADIO AND REAR VIEW CAMERA

1. Turn the ignition off.
2. Disconnect the C10 connector/LVDS cable at the back of the Radio.
3. Disconnect the LVDS cable at the Rear View Camera.
4. Connect the 9977-6-8 Adapter cable.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the LVDS cable for damage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. REPLACE THE REAR CAMERA AND RETEST FOR DTCS

1. Replace the Rear Camera in accordance with the service information.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

C221C-00-ECU FLASH REQUIRED

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On.
- Power supply is greater than 10.0 volts and less than 16.0 volts.

SET CONDITION

- The Radio detects that the module is in bootloader mode and has not been flashed programmed.
- This DTC will set after a Radio is replaced.

DEFAULT ACTION

- Radio functions and audio are completely inoperative.

POSSIBLE CAUSES

Possible Causes
RADIO REQUIRES FLASH PROGRAMMING

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- With the scan tool, program the Radio.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#).

U0010-00-CAN INTERIOR BUS

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable CAN IHS Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#).

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#).

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: Perform this diagnostic procedure **ONLY** when the DTC status is "Active". If the DTC status is "Stored" **DO NOT** proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to

COMMUNICATION DIAGNOSTIC PROCEDURE .

U0143-00-LOST COMMUNICATION WITH MULTI-PURPOSE MODULE (VEHICLE SYSTEM INTERFACE MODULE-VSIM)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0151-00-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0155-00-LOST COMMUNICATION WITH CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0164-00-LOST COMMUNICATION WITH HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0186-00-LOST COMMUNICATION WITH AUDIO AMPLIFIER

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0187-00 - LOST COMMUNICATION WITH DVD PLAYER

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0191-00-LOST COMMUNICATION WITH DIGITAL TELEVISION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0196-00-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE - REAR 1

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0199-00-LOST COMMUNICATION WITH DRIVER DOOR MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0200-00-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0206-00 LOST COMMUNICATION WITH POWER TOP CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0208-00 LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0209-00-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0230-00-LOST COMMUNICATION WITH POWER LIFTGATE MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0232-00 LOST COMMUNICATION WITH BLIND SPOT DETECTION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0249-00-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE - REAR 2

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **BODY VERIFICATION TEST** .

U0264-00-LOST COMMUNICATION WITH CAMERA MODULE-REAR

For a complete BACK UP CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio detects a open or short on the Low Voltage Digital Signal (LVDS) Camera circuits.

DEFAULT ACTION

- Camera inoperative.

POSSIBLE CAUSES

Possible Causes
LVDS CAMERA CIRCUITS DAMAGED
BACKUP CAMERA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. With the scan tool, perform the **Reset ECU** function under the Guided Diagnostics menu.
6. Cycle the ignition switch from on to off, wait five seconds and then back to on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. TEST THE REAR CAMERA

1. Turn the ignition off.
2. Disconnect the Rear Camera from the harness connector.

NOTE: The camera on this vehicle can be swapped with a like configured vehicle for testing purposes since it is not a "smart" module, nor is it VIN written, or connected to the network (CAN or LIN bus) for diagnostic purposes. The camera uses LVDS (Low Voltage Differential Signaling) for sending images to the module.

3. If available, swap the camera from a like configured vehicle. If a like configured vehicle is not available, replace the Rear Camera in accordance with the service information.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. With the scan tool, perform the **Reset ECU** function under the Guided Diagnostics menu.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- If a camera was swapped from a like configured vehicle return the camera to that vehicle.
- If the camera has been replaced because a like configured vehicle was not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. TEST THE REAR CAMERA CIRCUITS

1. Turn the ignition off.
2. Disconnect the coax cable/LVDS camera harness connector from the Radio.
3. Disconnect the known good working Camera from the vehicle harness connector.
4. Connect test tool cable kit (special tool #9977-6-8, Adapter, RG-174 Coax Cable) to the Radio and the known good Camera.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. With the scan tool, perform the **Reset ECU** function under the Guided Diagnostics menu.
8. Turn the Radio on and wait 25 seconds.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Rear Camera circuit(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. With the scan tool, perform the **Reset ECU** function under the Guided Diagnostics menu.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE**.

U0424-00-IMPLAUSIBLE DATA RECEIVED FROM HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE**.

U0487-00-IMPLAUSIBLE DATA RECEIVED FROM AUDIO AMPLIFIER

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0531-00 IMPLAUSIBLE DATA RECEIVED FROM POWER LIFTGATE MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1176-00-LOST COMMUNICATION WITH EMERGENCY ALERT MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11B8-00 LOST COMMUNICATION WITH INTEGRATED CENTER STACK (ICS)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11BB-00-LOST COMMUNICATION WITH VIDEO ROUTING MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11FA-00-LOST COMMUNICATION WITH RIGHT BLIND SPOT SENSOR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11FB-00-LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U120E-00-LOST COMMUNICATION WITH COMFORT SEAT AND WHEEL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1215-00-LOST COMMUNICATION WITH FORWARD FACING CAMERA

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U12A7-00-LOST COMMUNICATION WITH DISPLAY SCREEN MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U12AE-00 LOST COMMUNICATION WITH CENTRAL VISION PROCESSING MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1430-00-IMPLAUSIBLE DATA RECEIVED FROM COMFORT SEAT AND WHEEL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1445-00-IMPLAUSIBLE DATA RECEIVED FROM DISPLAY SCREEN MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1480-00-IMPLAUSIBLE DATA RECEIVED FROM INTEGRATED CENTER STACK

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U147D-00-IMPLAUSIBLE DATA RECEIVED FROM RIGHT BLIND SPOT SENSOR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U147E-00-IMPLAUSIBLE DATA RECEIVED FROM LEFT BLIND SPOT SENSOR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1519-00-IMPLAUSIBLE DATA RECEIVED FROM VIDEO ROUTING MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

2021 ACCESSORIES AND EQUIPMENT

Audio (Radio) - DTCS B1400-11 To B1579-1A - Gladiator

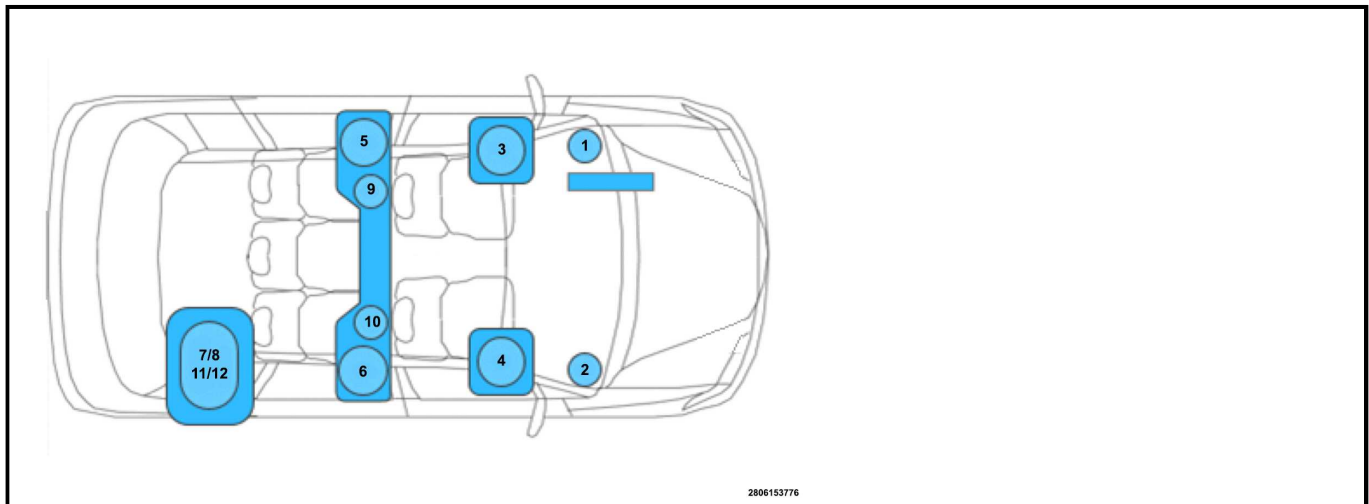
DIAGNOSIS AND TESTING

B1400-11-FRONT LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND

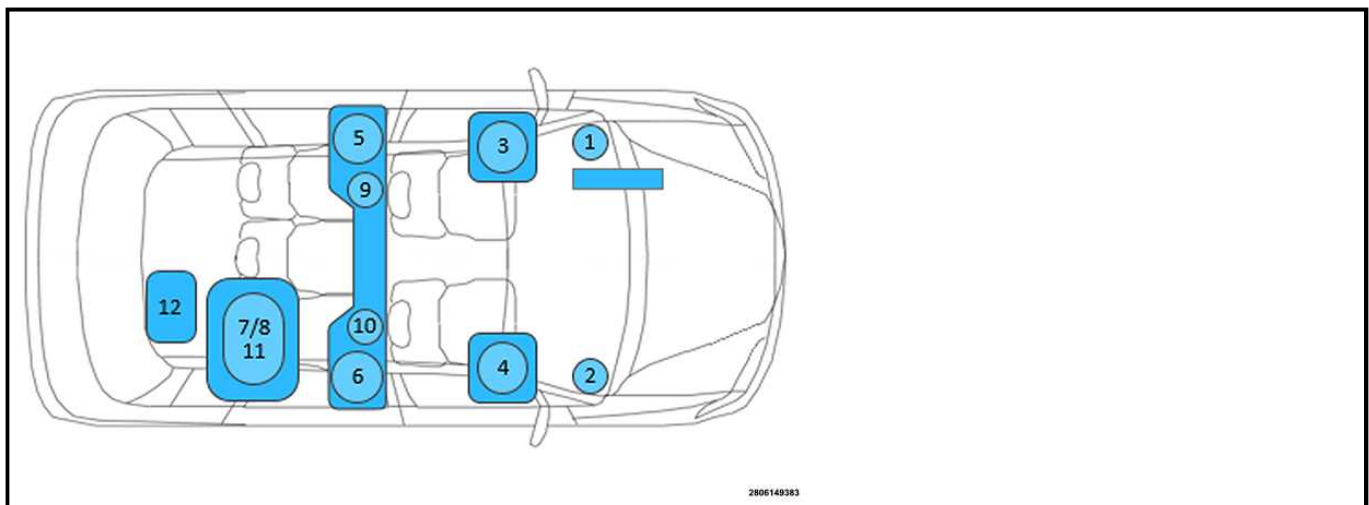
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to ground condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X201	(+)
X291	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X53	(+)
X55	(-)

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on.
9. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. With the scan tool, erase DTCs.
13. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
14. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

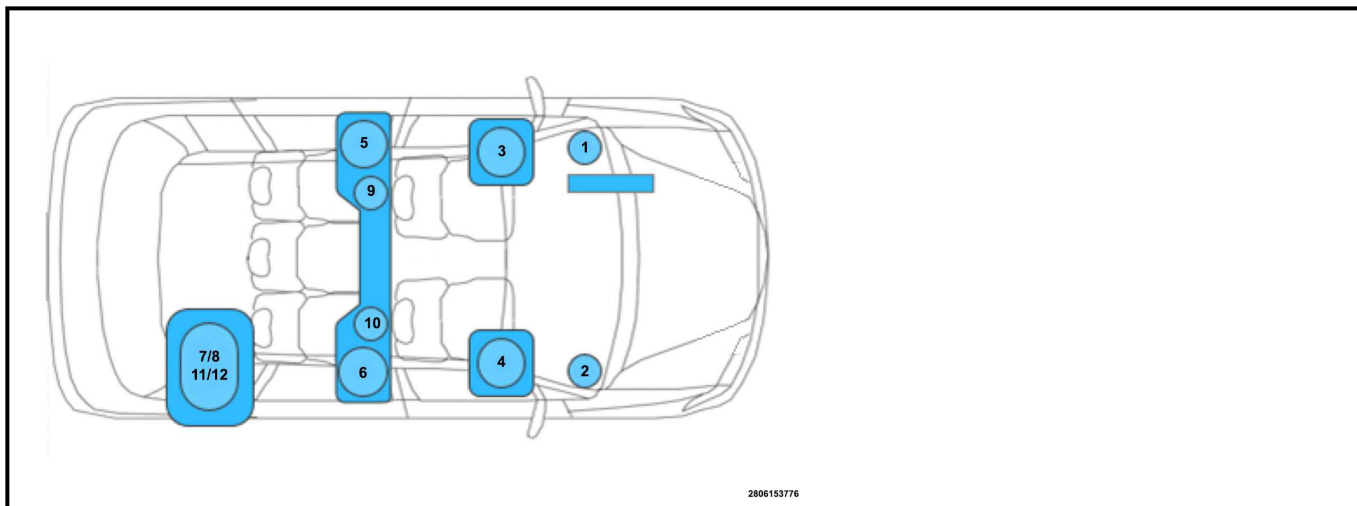
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1400-12-FRONT LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY

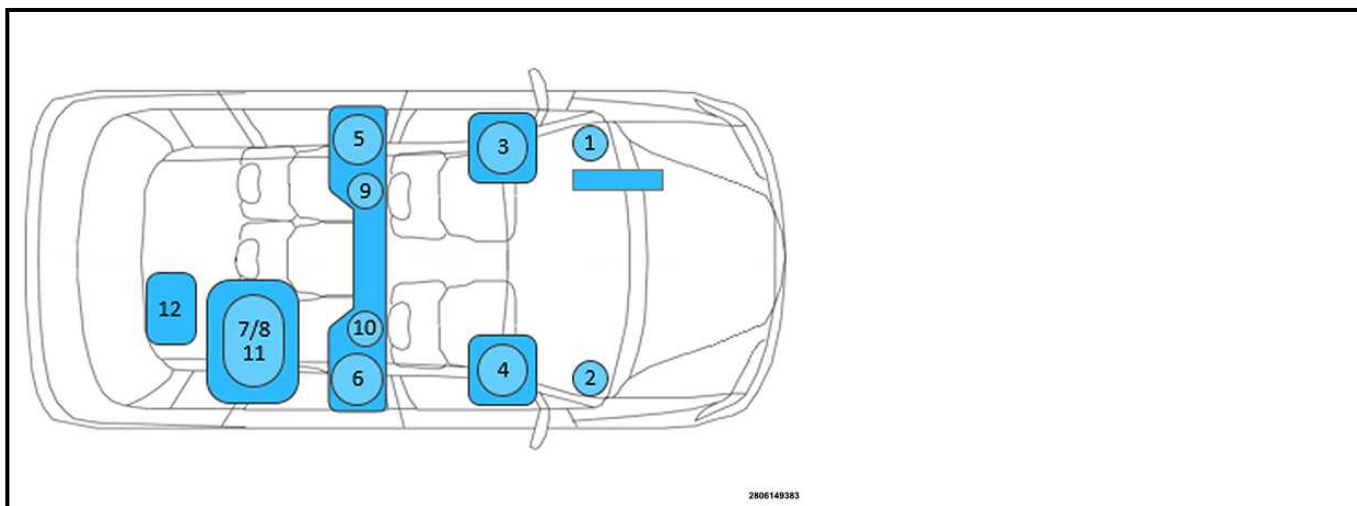
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to battery condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X201	(+)
X291	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X53	(+)
X55	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

6. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

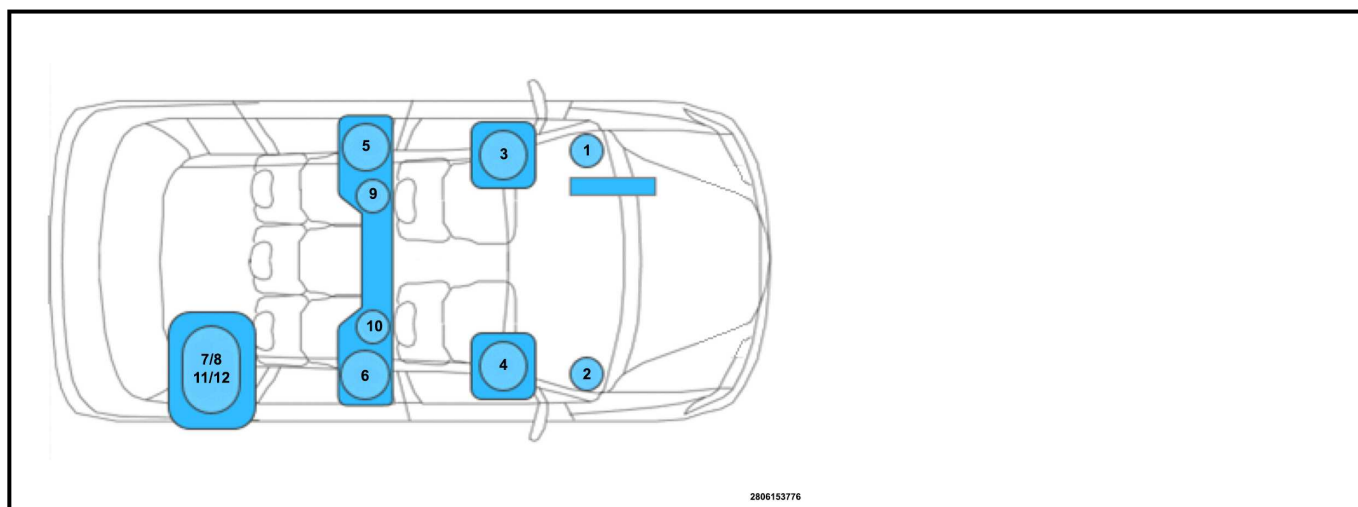
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1400-13-FRONT LEFT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN

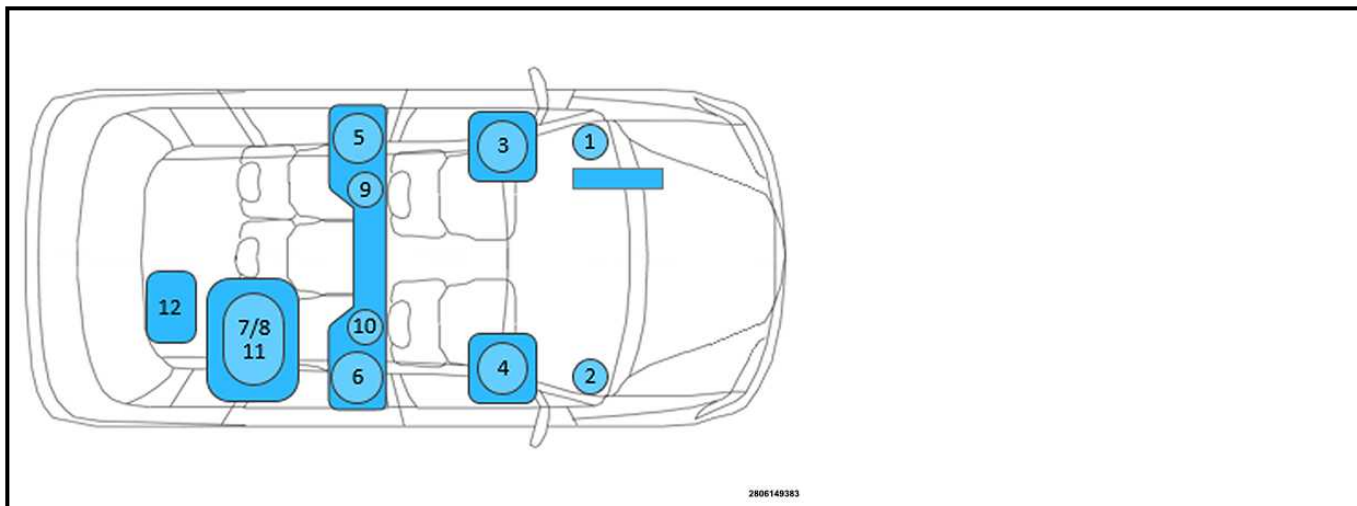
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects an open condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT OPEN RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X201	(+)
X291	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X53	(+)
X55	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

4. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

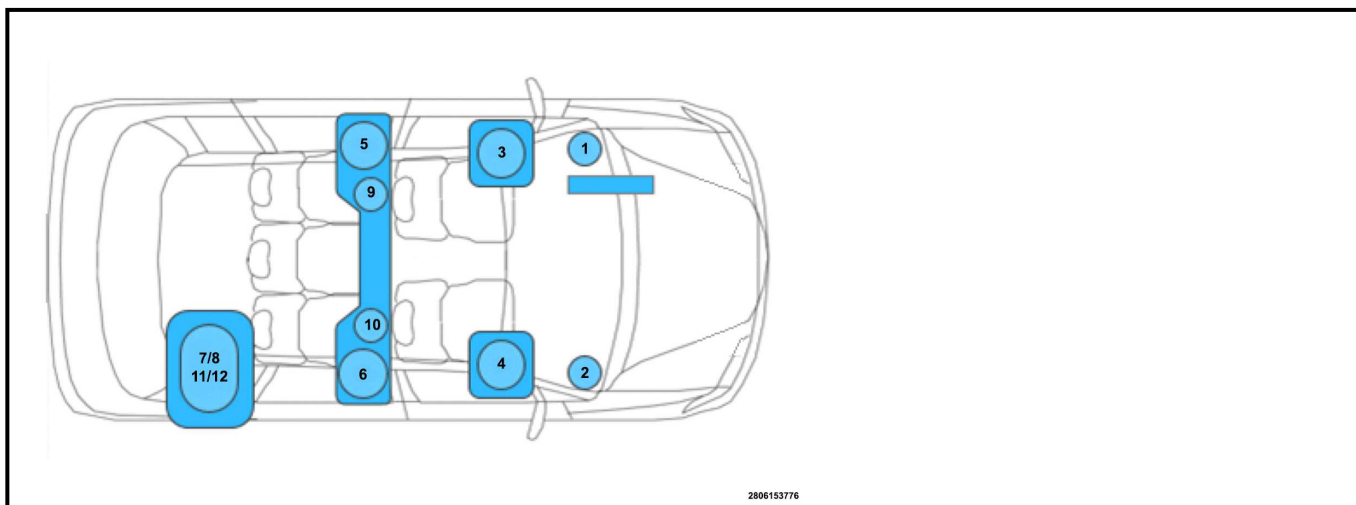
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1400-1A-FRONT LEFT AUDIO SPEAKER OUTPUT - CIRCUIT RESISTANCE BELOW THRESHOLD

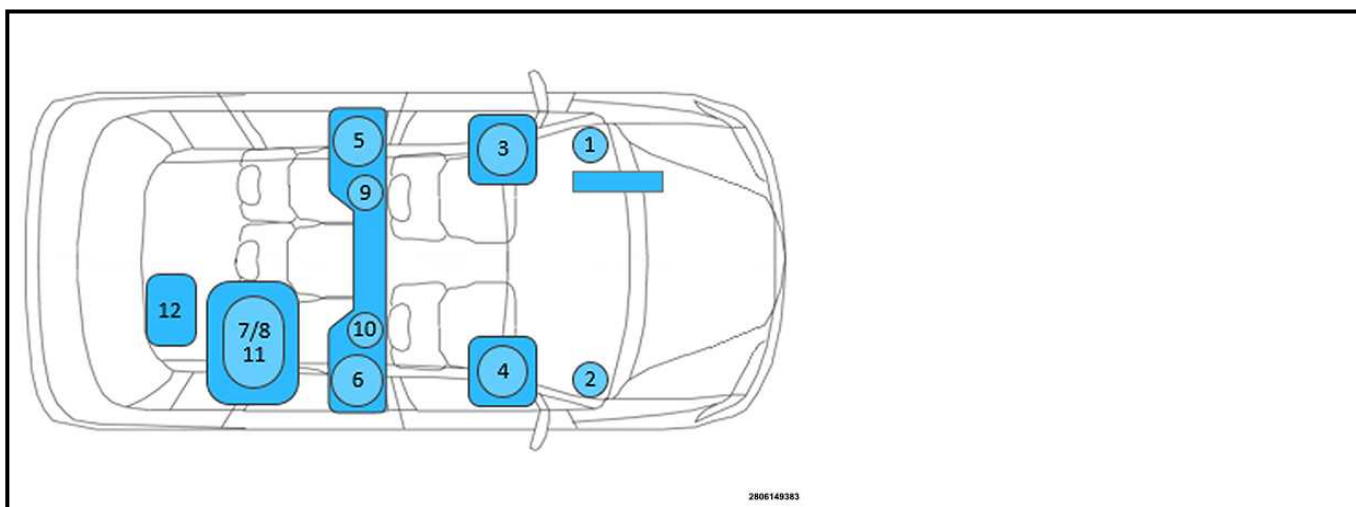
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a short together condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X201	(+)
X291	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X53	(+)
X55	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE SPEAKER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Speaker harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

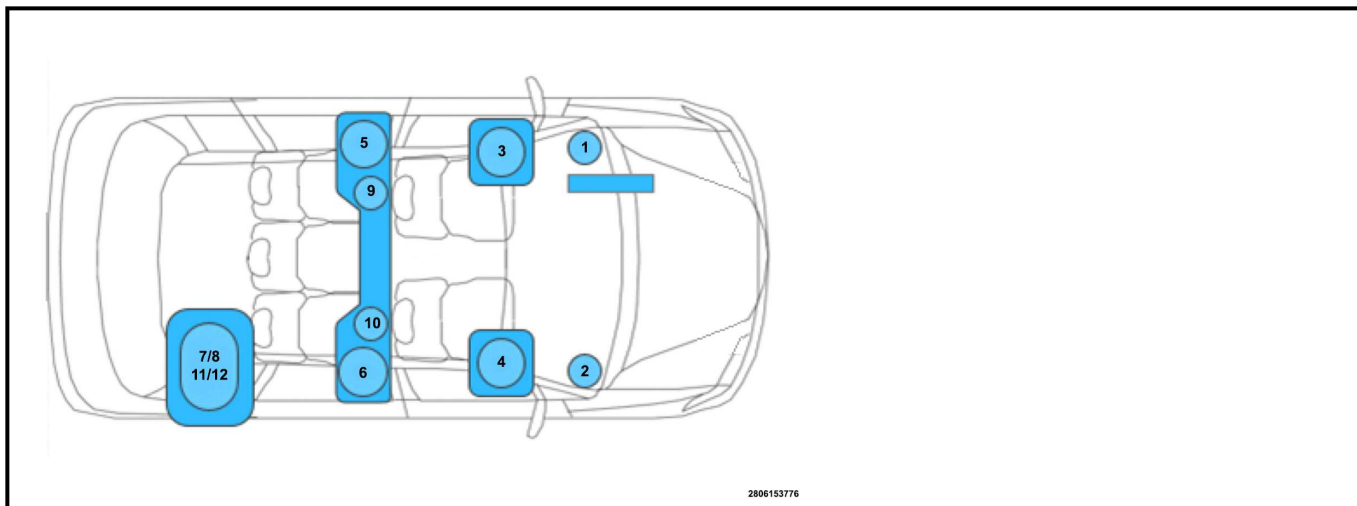
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1400-92-FRONT LEFT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION

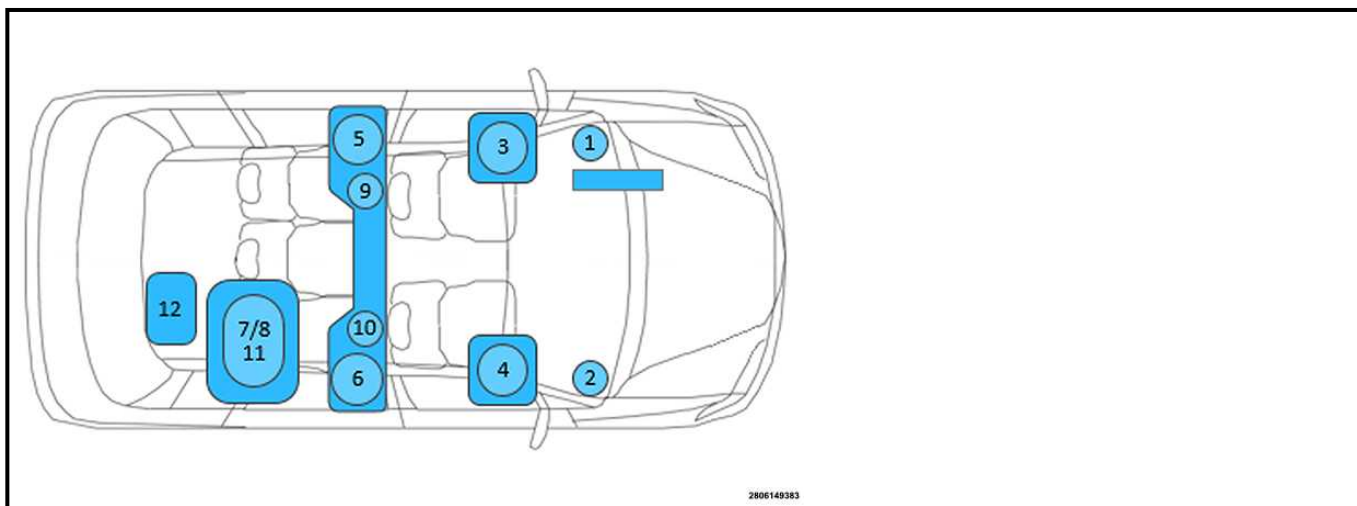
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio sets a Diagnostic Trouble Code (DTC) when a Direct Current (DC) offset occurs on a speaker circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Replace the Radio in accordance with the service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

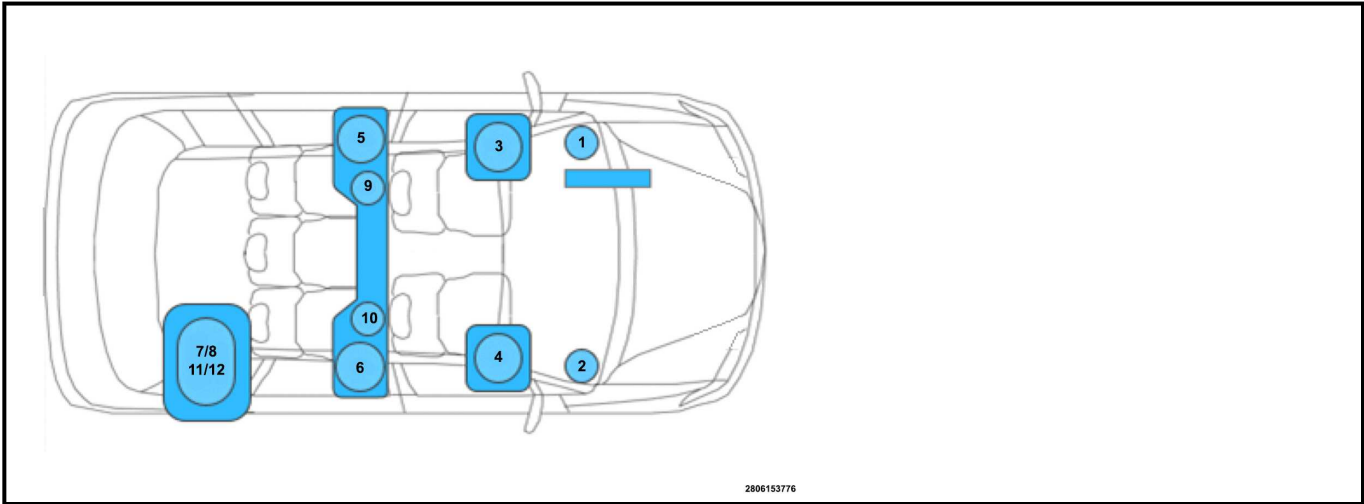
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B1404-11-FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND

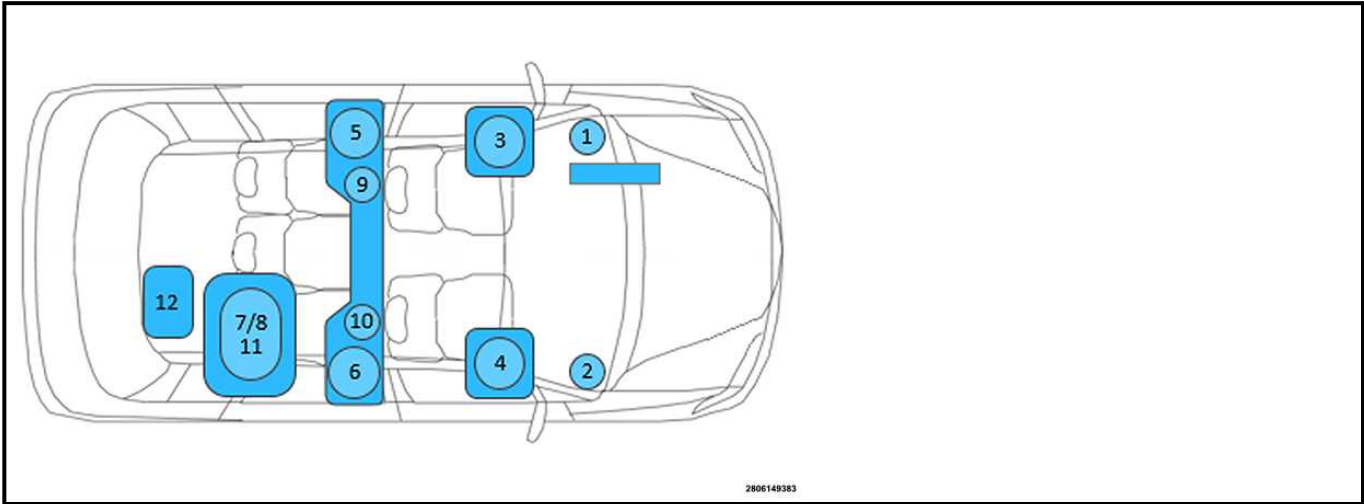
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to ground condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X202	(+)
X292	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X54	(+)
X56	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on.
9. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. With the scan tool, erase DTCs.
13. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
14. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

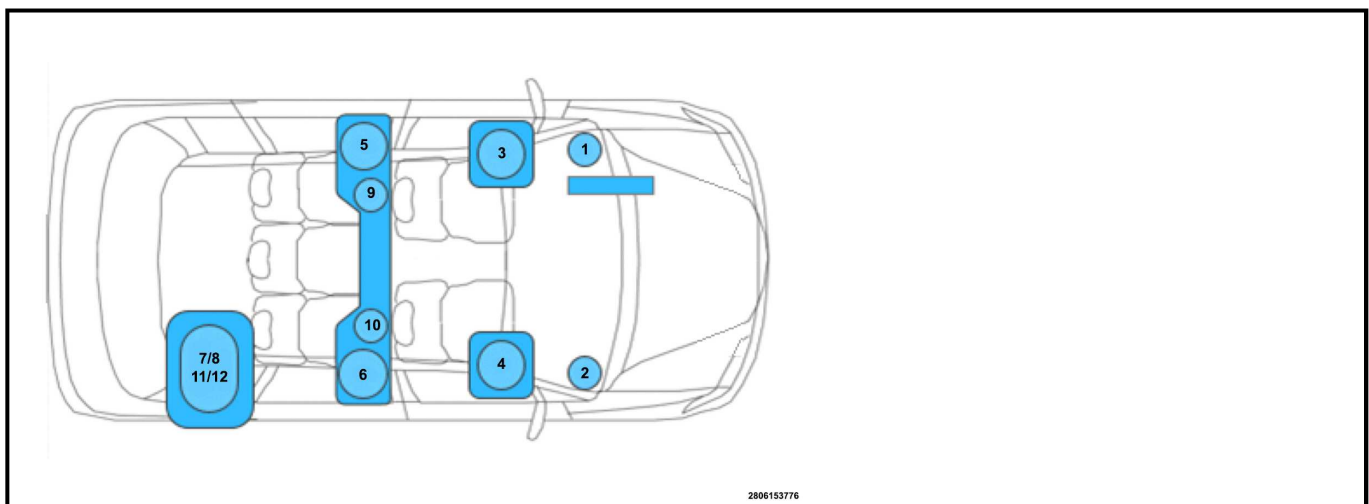
B1404-12-FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

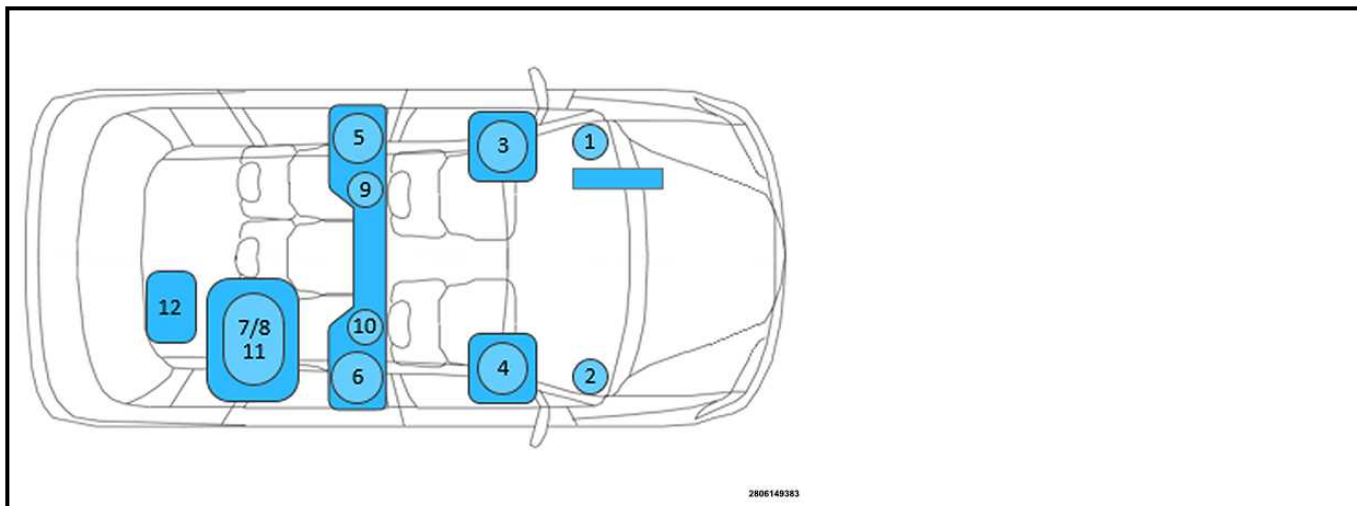
AUDIO CHANNEL MAPPING

NOTE:

Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to battery condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X202	(+)
X292	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X54	(+)
X56	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

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4. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

6. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

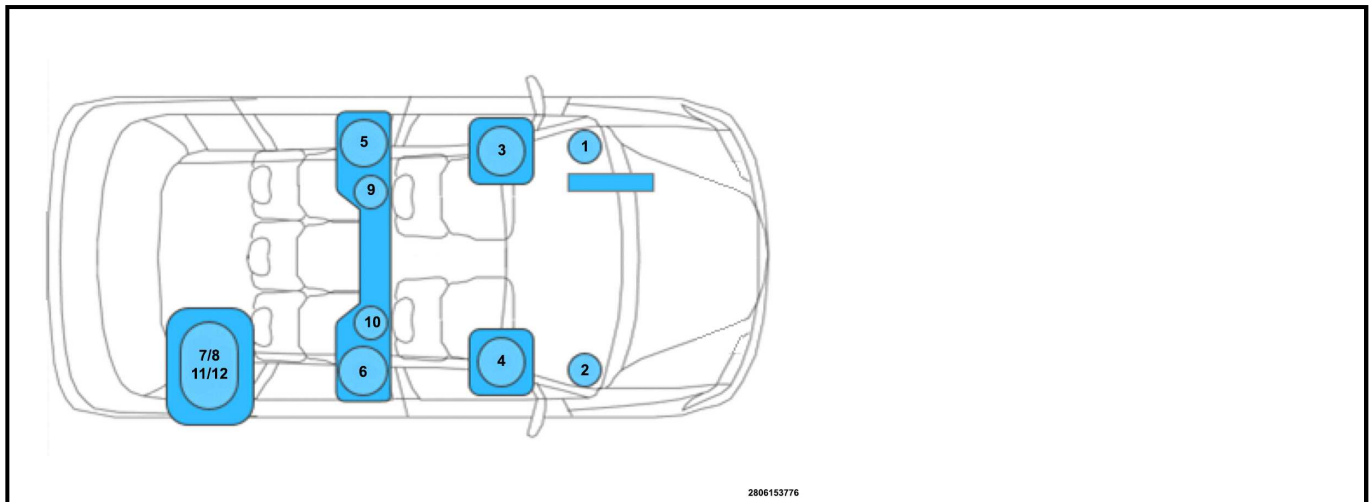
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1404-13-FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN

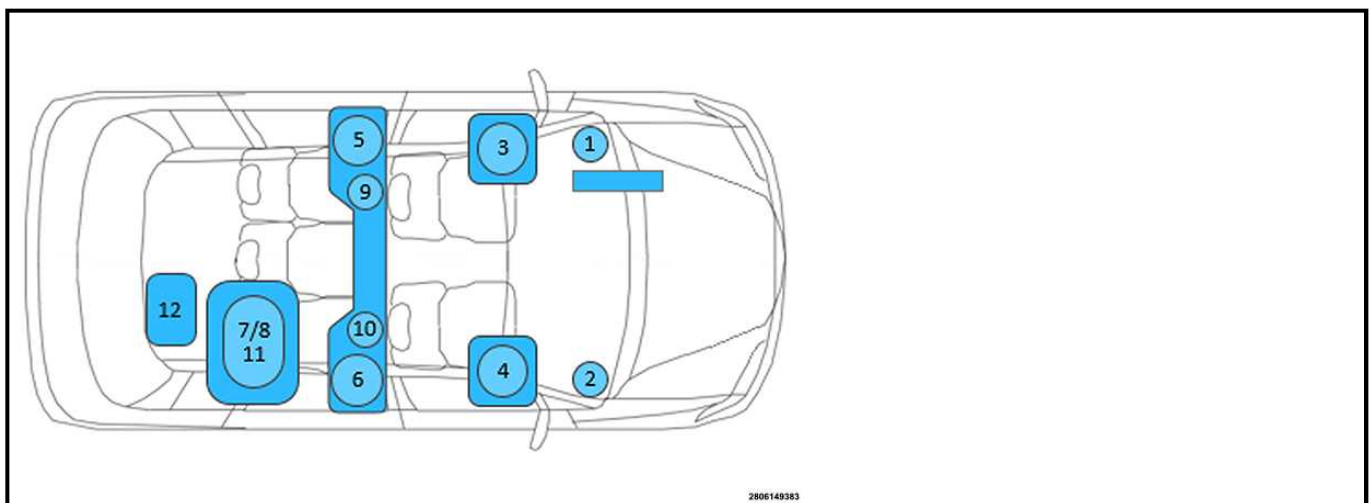
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects an open condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT OPEN RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X202	(+)
X292	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X54	(+)
X56	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCS.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.

9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

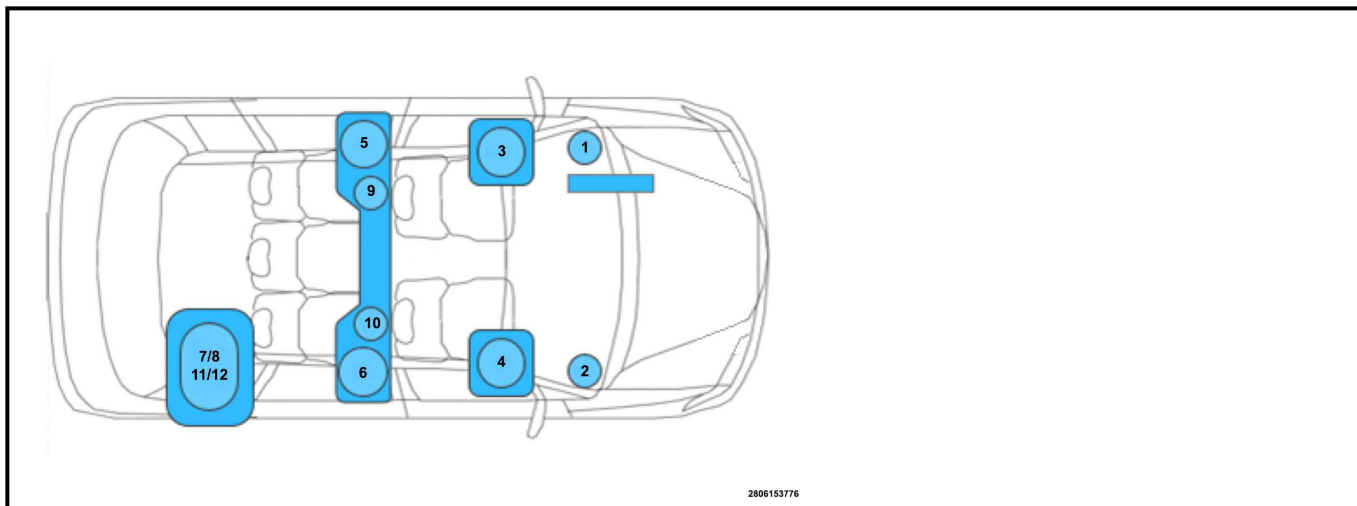
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1404-1A-FRONT RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT RESISTANCE BELOW THRESHOLD

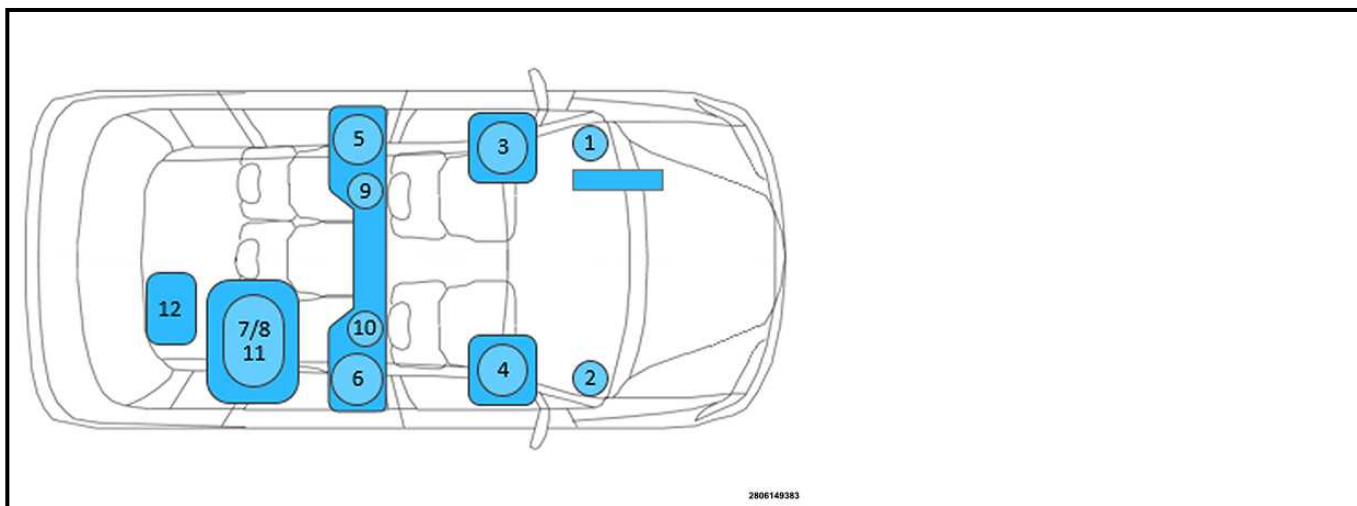
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a short together condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X202	(+)
X292	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X54	(+)
X56	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE SPEAKER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Speaker harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.

10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

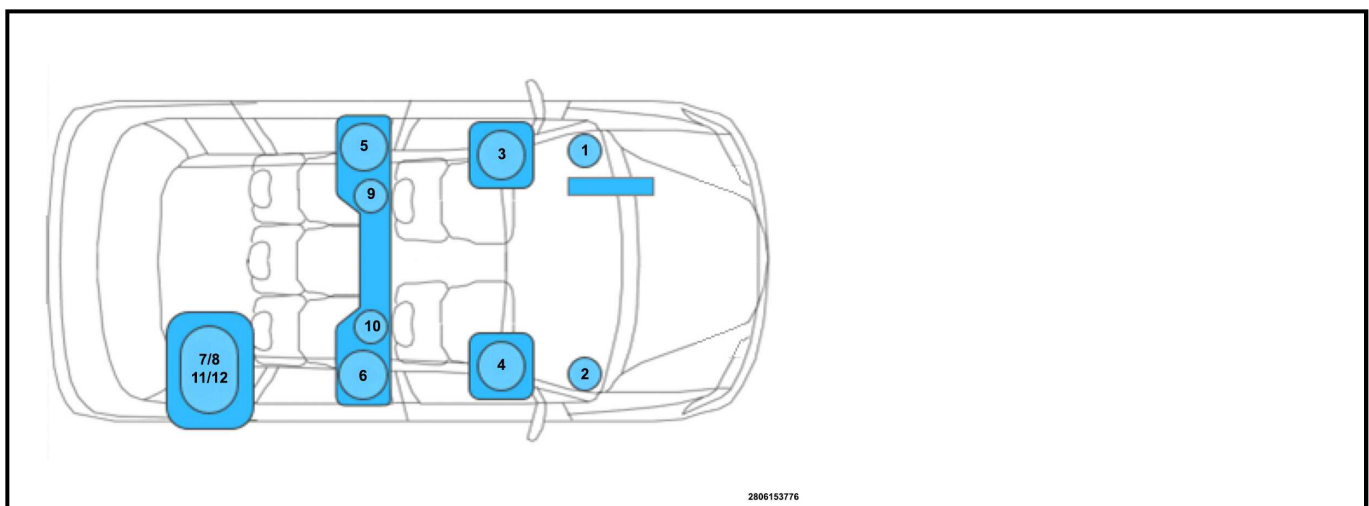
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1404-92-FRONT RIGHT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION

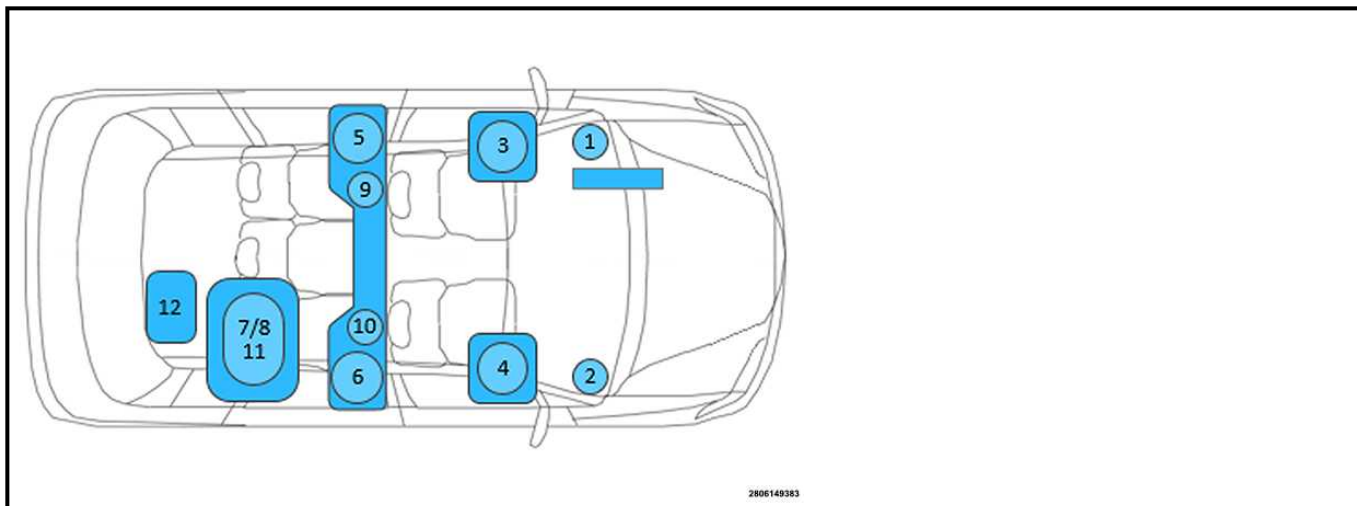
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio sets a Diagnostic Trouble Code (DTC) when a Direct Current (DC) offset occurs on a speaker circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Replace the Radio in accordance with the service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

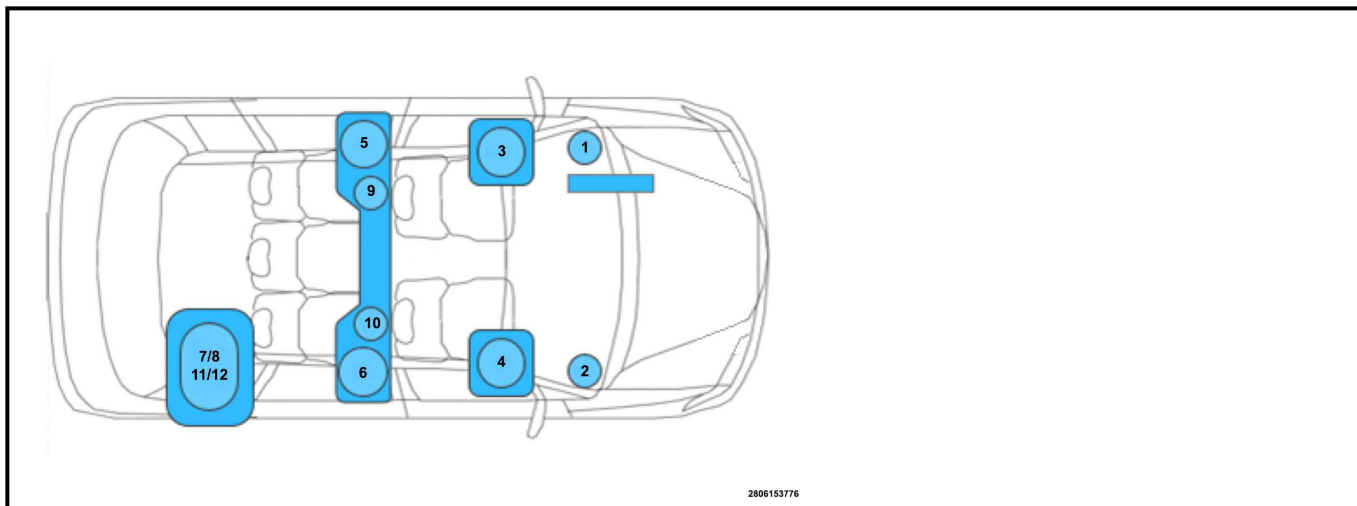
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1408-11-REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND

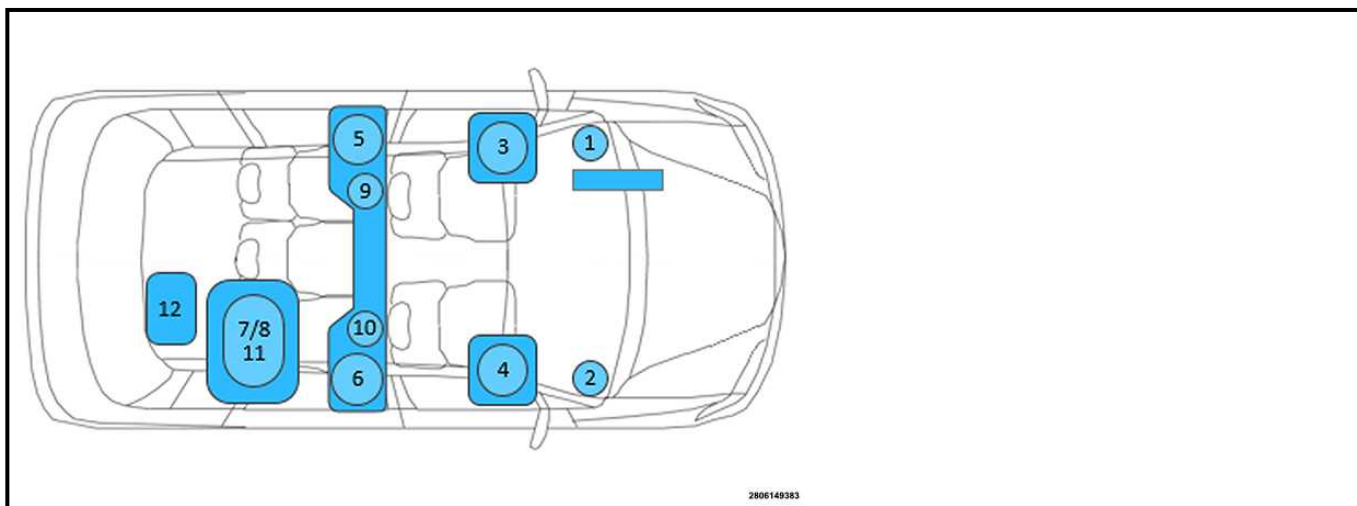
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to ground condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X205	(+)
X295	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X51	(+)
X57	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Turn the Radio on.
9. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. With the scan tool, erase DTCs.
13. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
14. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

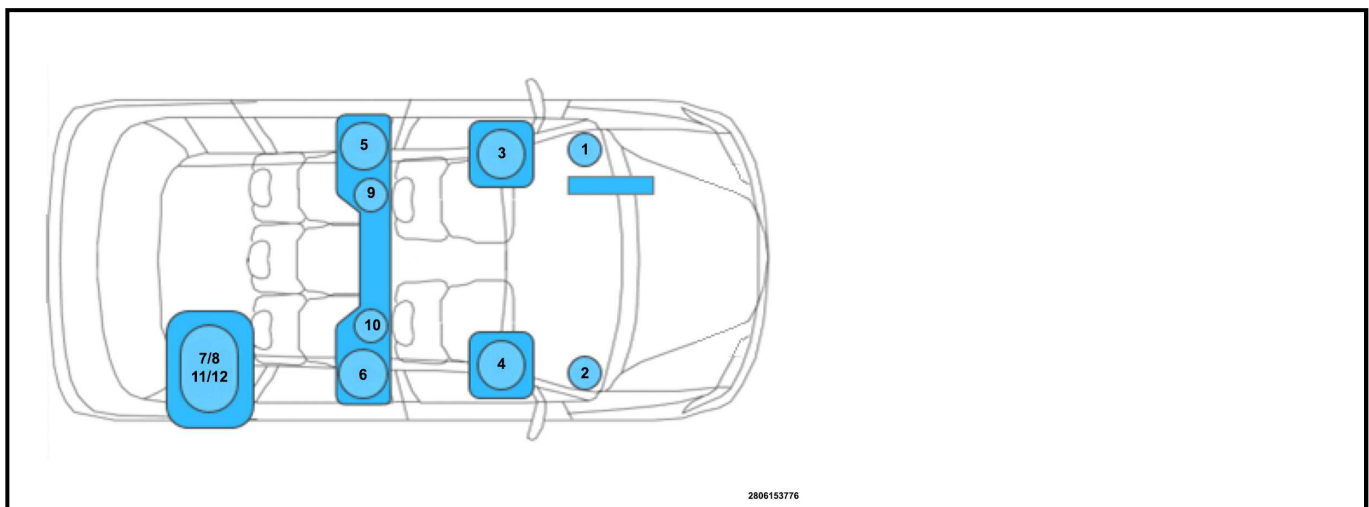
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1408-12-REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY

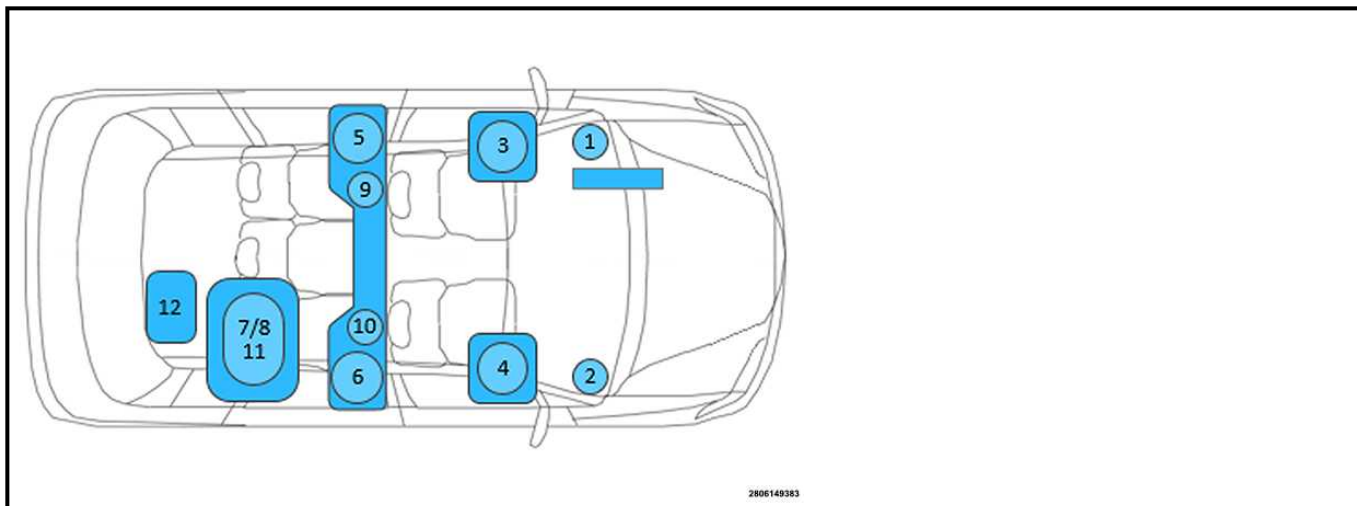
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to battery condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X205	(+)
X295	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X51	(+)
X57	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

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4. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

6. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

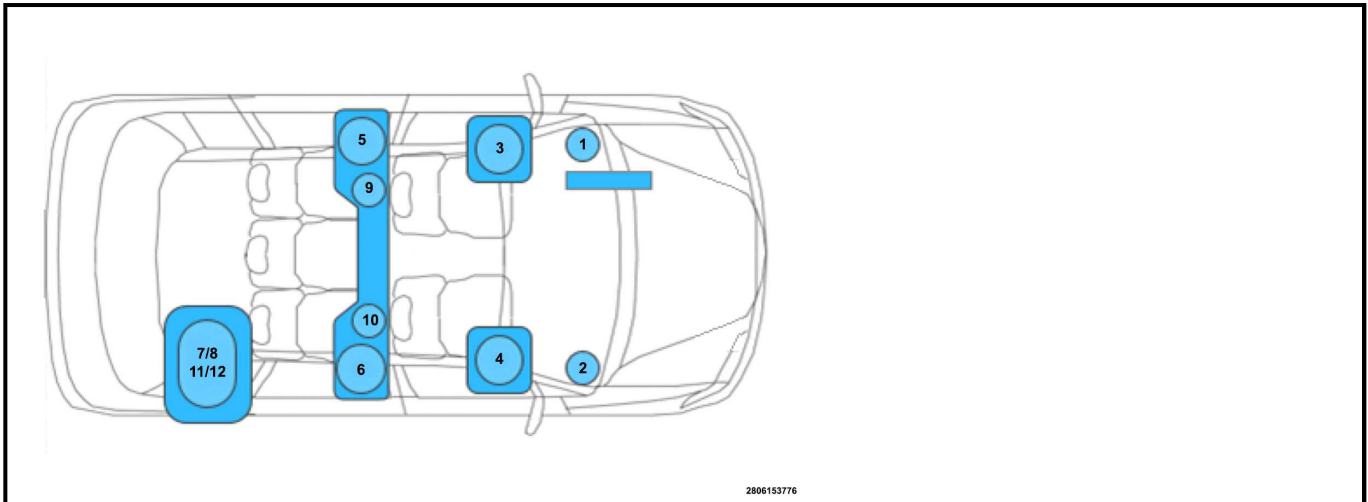
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1408-13-REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN

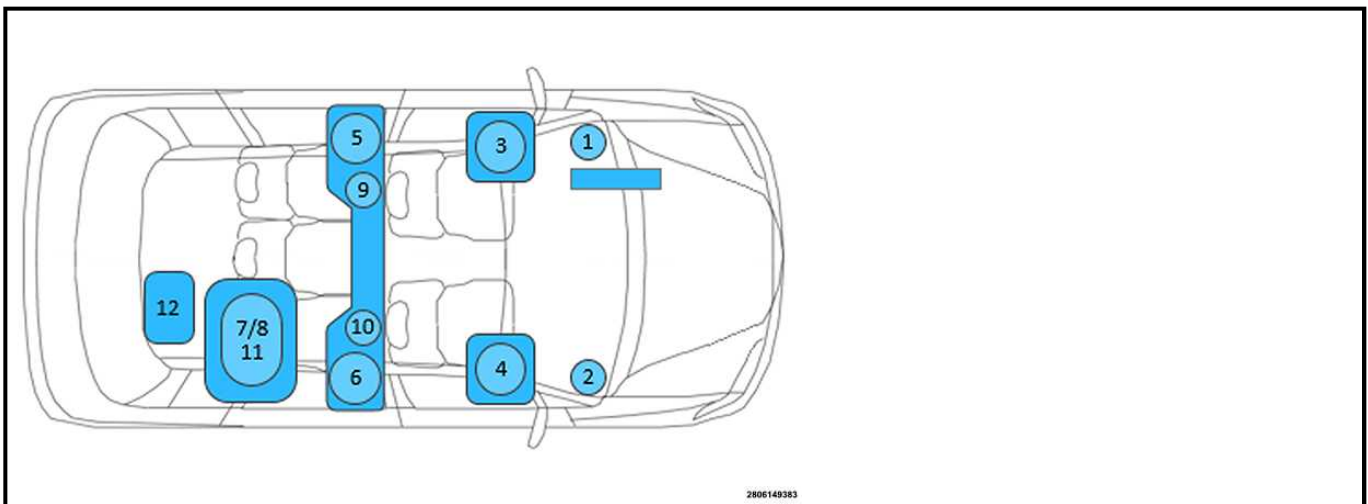
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects an open condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT OPEN RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X205	(+)
X295	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X51	(+)
X57	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCS.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.

9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

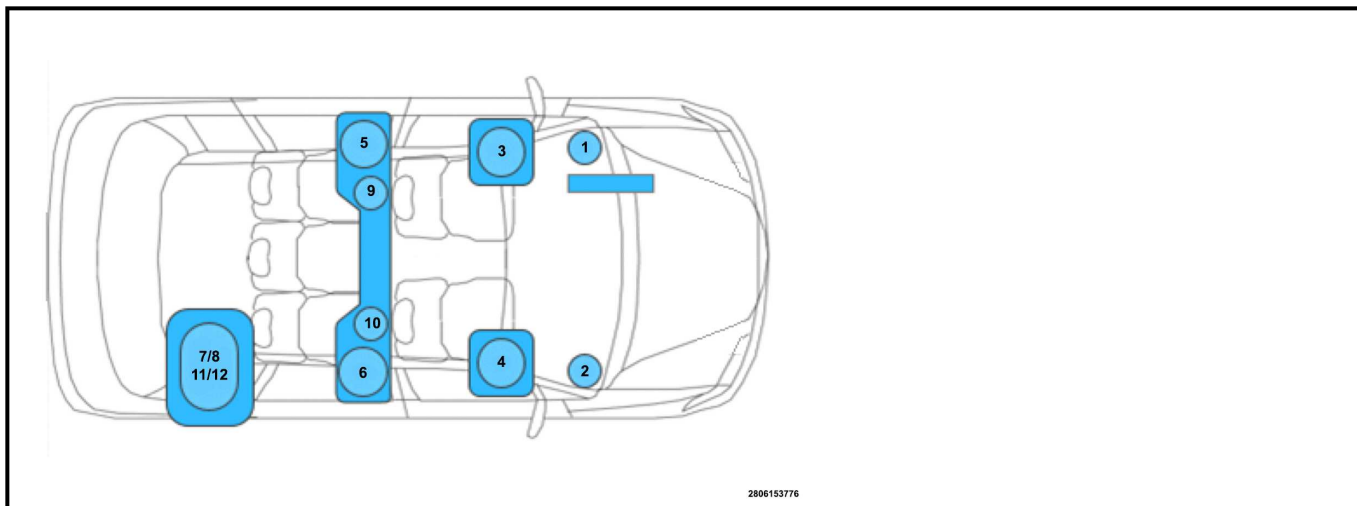
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1408-1A-REAR LEFT AUDIO SPEAKER OUTPUT-CIRCUIT RESISTANCE BELOW THRESHOLD

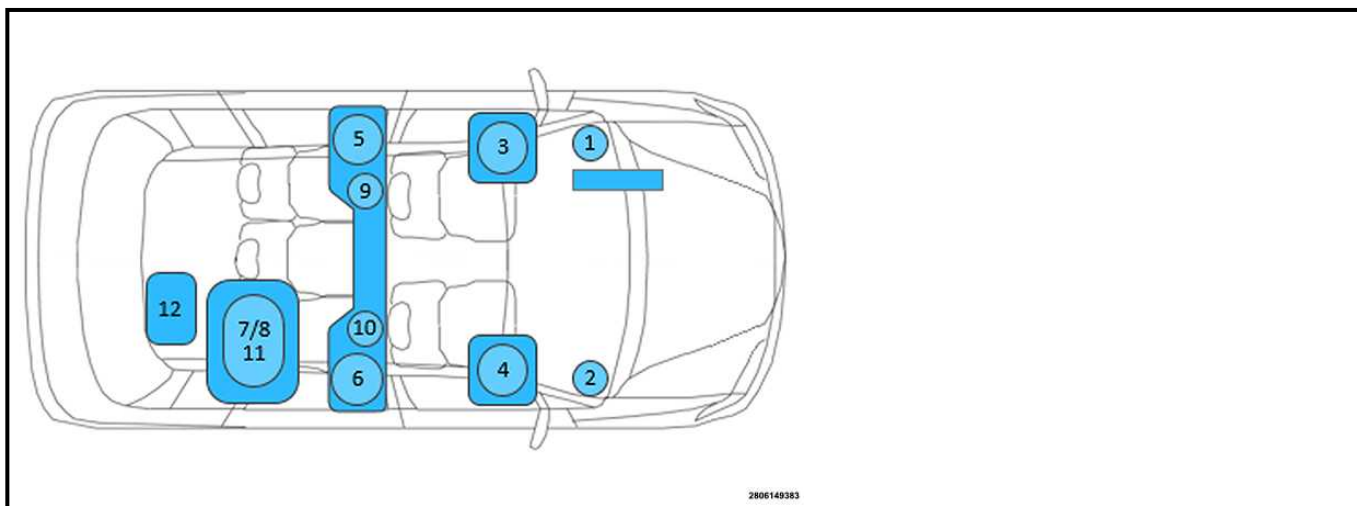
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a short together condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X205	(+)
X295	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X51	(+)
X57	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE SPEAKER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Speaker harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.

10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

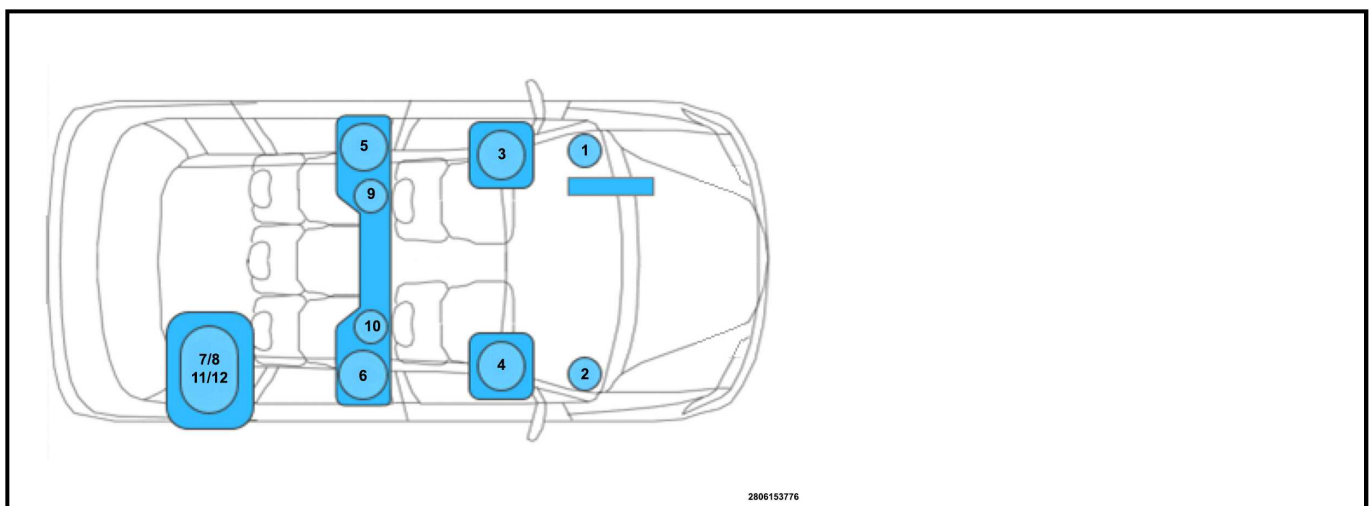
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1408-92-REAR LEFT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION

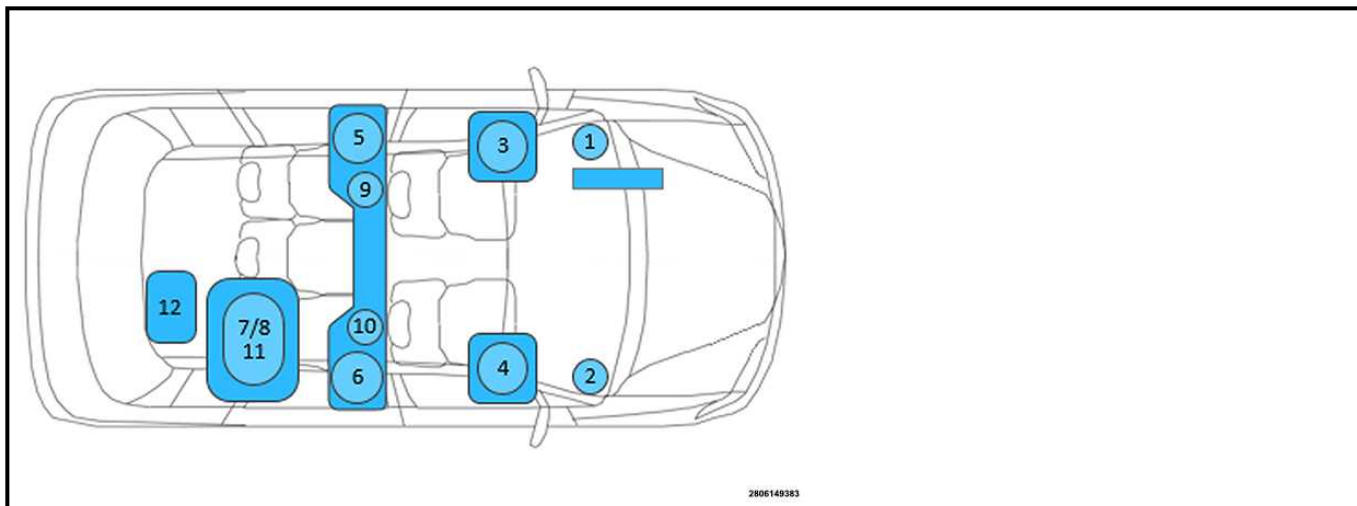
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio sets a Diagnostic Trouble Code (DTC) when a Direct Current (DC) offset occurs on a speaker circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Replace the Radio in accordance with the service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

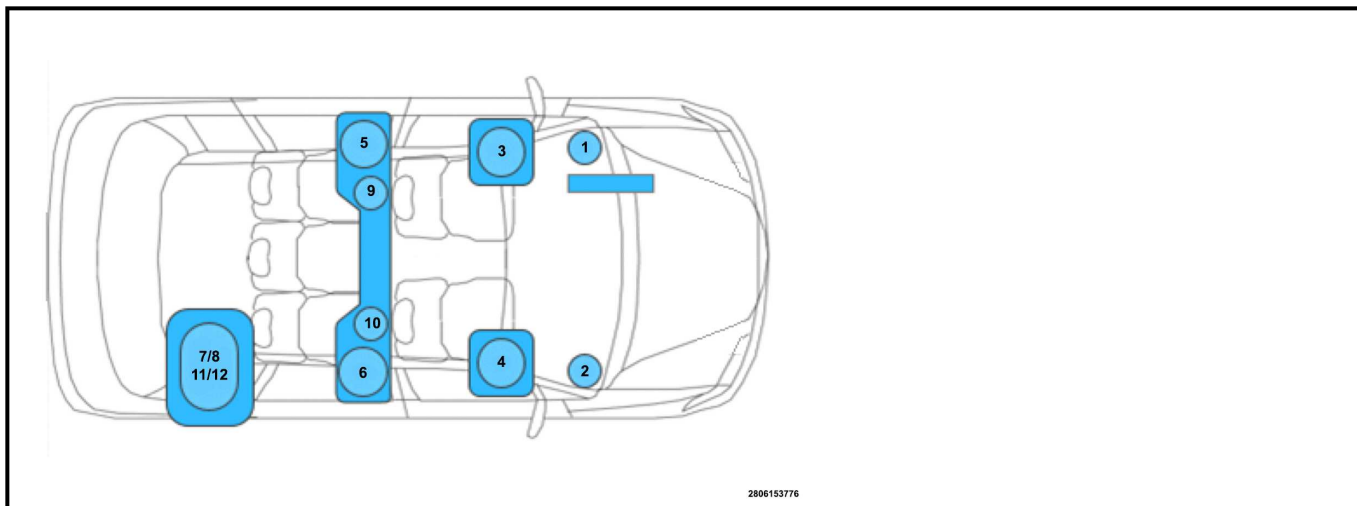
- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B140C-11-REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO GROUND

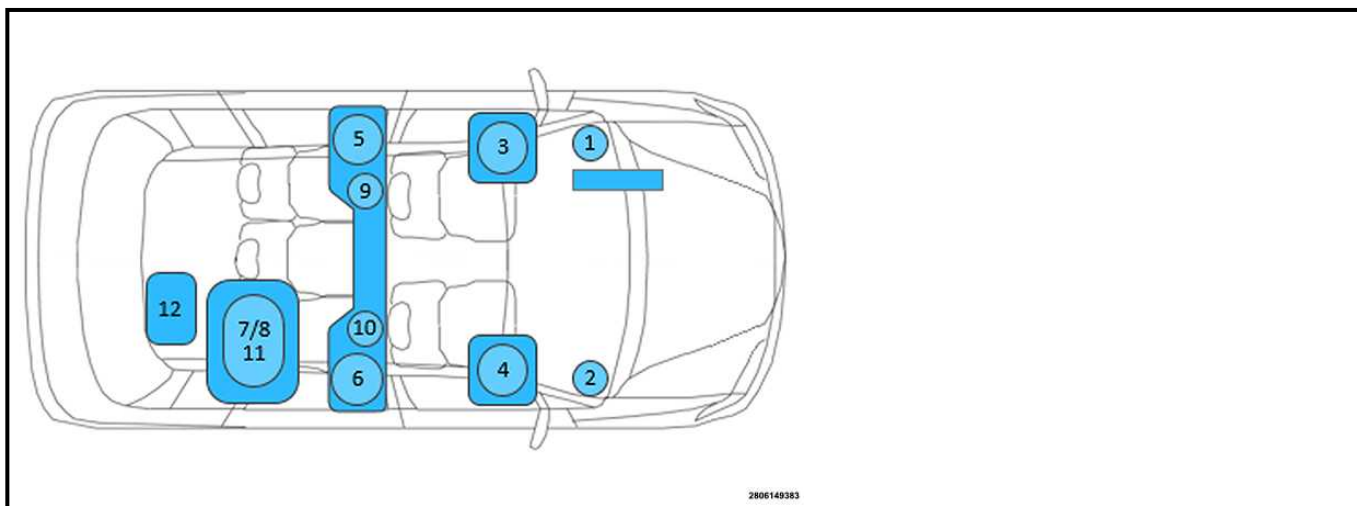
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to ground condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT SHORTED TO GROUND RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X206	(+)
X296	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X52	(+)
X58	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE RELATED SPEAKER(S)

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related speaker(s) harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Turn the Radio on.
9. With the scan tool, read the Amplifier DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. With the scan tool, erase DTCs.
13. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
14. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

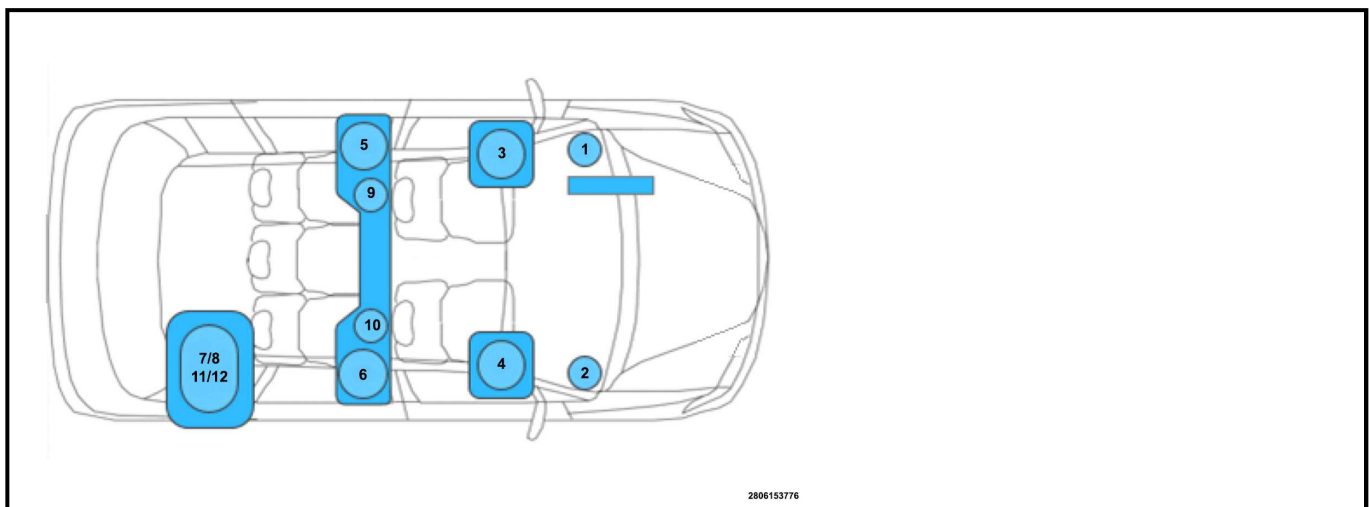
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B140C-12-REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT SHORT TO BATTERY

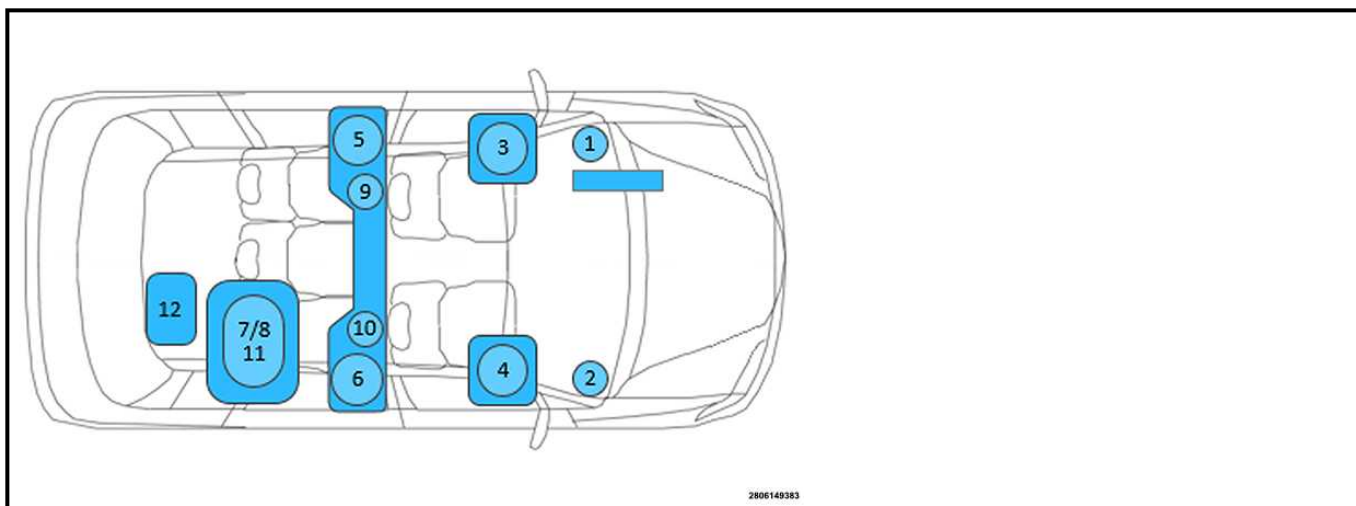
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects a short to battery condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER (+/-) CIRCUIT SHORTED TO VOLTAGE RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X206	(+)
X296	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X52	(+)
X58	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to **AMPLIFIER (AMP), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

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4. CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

6. CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE AMPLIFIER HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

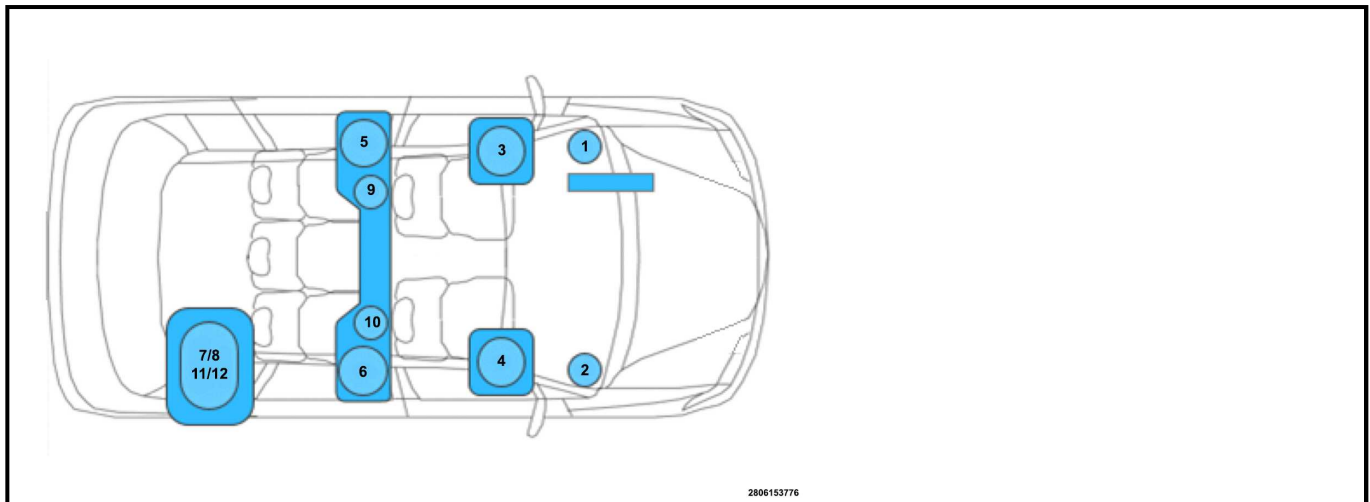
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B140C-13-REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT OPEN

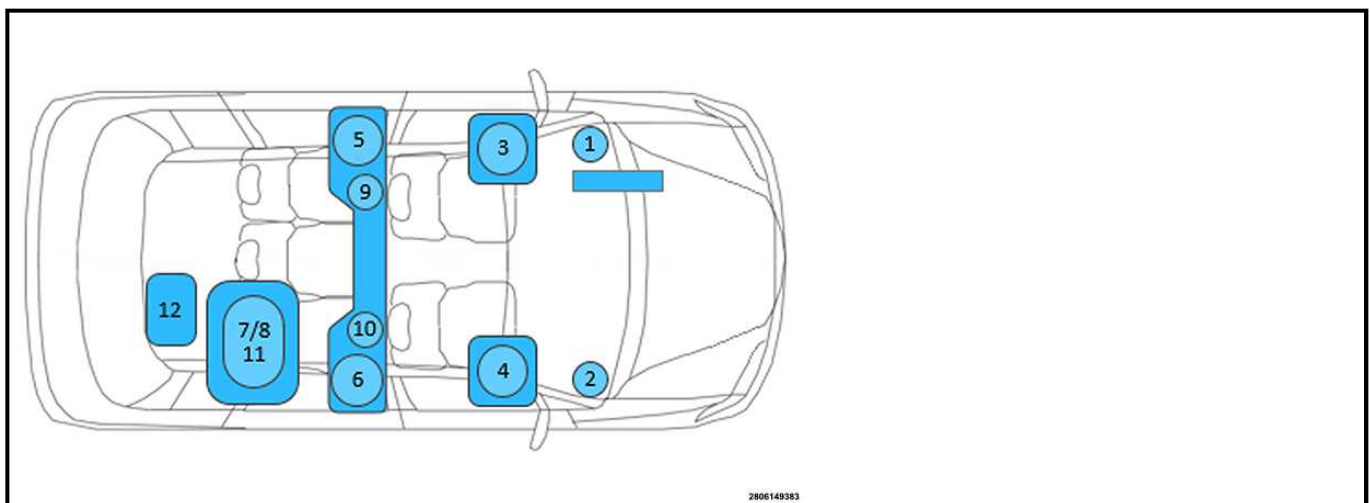
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio detects an open condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+/-) CIRCUIT OPEN RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X206	(+)
X296	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X52	(+)
X58	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCS.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCS.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.

9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. REPLACE THE RELATED SPEAKER(S)

1. Replace the related speaker(s) in accordance with the Service Information. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacement of the speaker(s) has corrected the concern.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

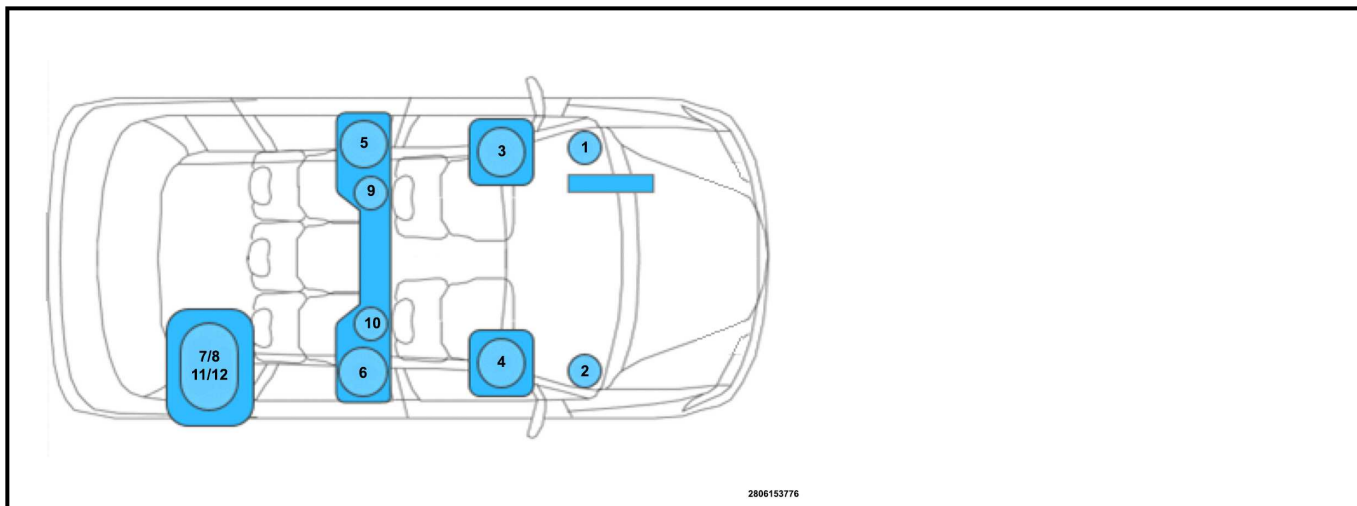
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B140C-1A - REAR RIGHT AUDIO SPEAKER OUTPUT-CIRCUIT RESISTANCE BELOW THRESHOLD

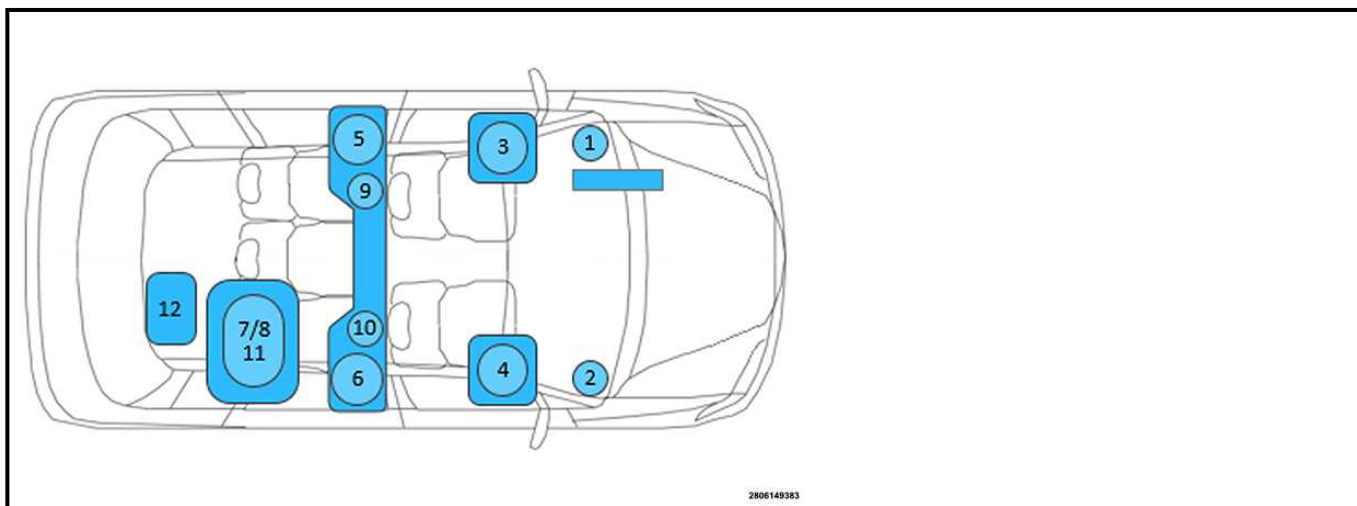
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

AUDIO CHANNEL MAPPING

NOTE: **Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.**



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a short together condition on a speaker output circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
AMPLIFIER SPEAKER SPEAKER (+) CIRCUIT SHORTED TO THE SPEAKER (-) CIRCUIT RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

SPEAKER CIRCUITS

Base - without Amplifier

Circuit ID	Circuit Description
X206	(+)
X296	(-)

Premium - Radio with Amplifier

Circuit ID	Circuit Description
X52	(+)
X58	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE VEHICLE AUDIO SYSTEM

1. Review the vehicle sales codes and configuration to determine the vehicle audio system.

Is the vehicle equipped with an Amplifier?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE AMPLIFIER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Amplifier harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Amplifier in accordance with the Service Information. Refer to [AMPLIFIER \(AMP\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE SPEAKER

1. Make sure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Speaker harness connector.
5. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Turn the radio on and set the volume to 25.
9. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the related speaker in accordance with the Service Information. Refer to **SPEAKER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE SPEAKER (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SPEAKER (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and AMP (if equipped), and then erase DTCs.

10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

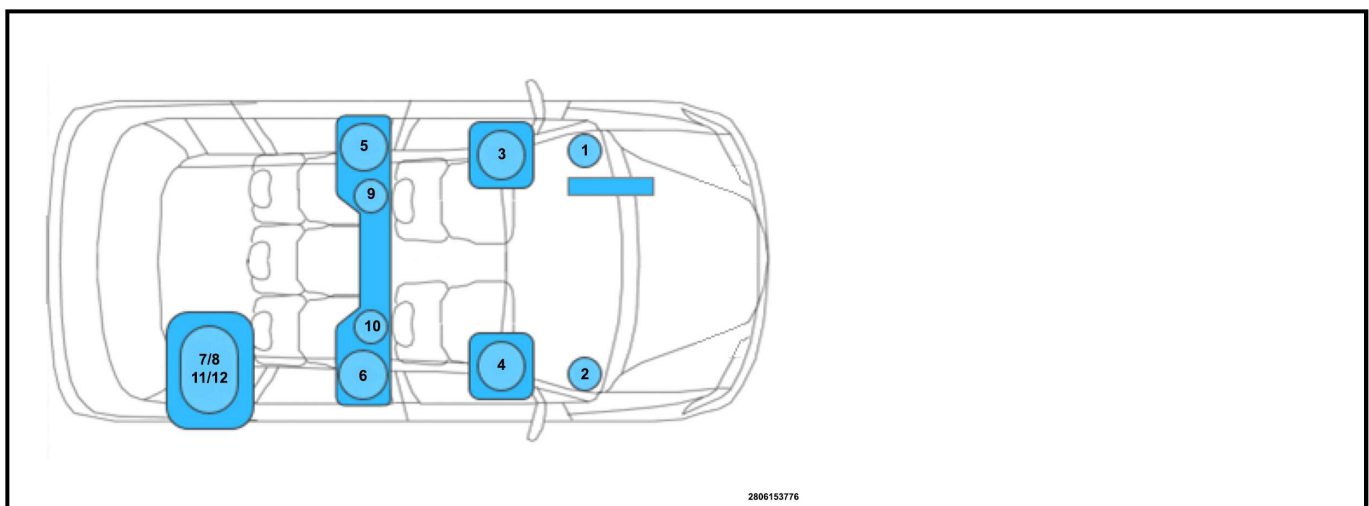
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B140C-92-REAR RIGHT AUDIO SPEAKER OUTPUT-PERFORMANCE OR INCORRECT OPERATION

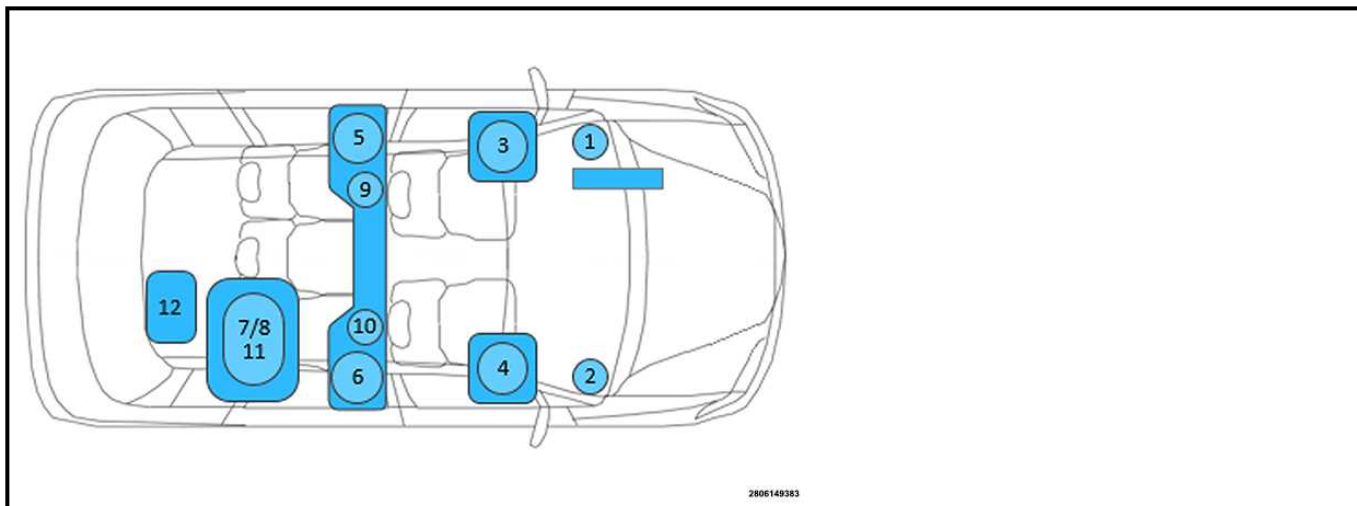
For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

AUDIO CHANNEL MAPPING

NOTE: Proper diagnosis of the audio system will require the use of this Audio Channel Mapping in addition to using the Audio System wiring diagrams. The use of Audio Channel Mapping and sales codes are being used to quickly identify those differences in locations; and the total number of speakers in the audio system configurations noted below.



CHANNEL 12	
SALES CODE	DESCRIPTION
Without RSJ	WIRELESS SPEAKER - BLUETOOTH



CHANNEL 12	
SALES CODE	DESCRIPTION
RSJ	WIRELESS SPEAKER - BLUETOOTH

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Radio on.

SET CONDITION

- The Radio sets a Diagnostic Trouble Code (DTC) when a Direct Current (DC) offset occurs on a speaker circuit.

DEFAULT ACTION

- The Radio automatically shuts down the speaker circuit output when this fault is detected.

POSSIBLE CAUSES

Possible Causes
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Replace the Radio in accordance with the service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B142A-4B-RADIO UNIT HIGH TEMPERATURE - OVER TEMPERATURE

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio on.

SET CONDITION

- The code will set if the temperature inside the radio is between 175°F and 220°F.

DEFAULT ACTION

- One or more modes in the Radio may be unavailable.

POSSIBLE CAUSES

Possible Causes
RADIO SUBJECTED TO EXTREME HIGH AMBIENT TEMPERATURE
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. With the scan tool, read the active Radio DTCs.

NOTE: A front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE OPERATION OF THE RADIO

1. If the vehicle has been in the hot sunlight or extreme cold, move the vehicle indoors and open the doors to allow the inside temperature to stabilize.
2. Start the engine and allow the engine to reach normal operating temperature.
3. The Radio should operate between -23°C and 65°C (-10°F and 149°F).
4. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes - First and only occurrence

- Turn the Radio off and allow the unit to cool before retesting.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

Yes - Multiple Occurrences

- Replace the Radio in accordance to the service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Test Complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1431-00-BLUETOOTH ANTENNA INTERNAL PERFORMANCE

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio detects an internal fault with the Bluetooth antenna.

DEFAULT ACTION

- No Bluetooth operation.

POSSIBLE CAUSES

Possible Causes
BLUETOOTH ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE BLUETOOTH CABLE AND CONNECTIONS

1. Turn the ignition off.
2. Inspect the Bluetooth cable connection at the rear of the Radio.
3. Inspect the Bluetooth cable connection at Bluetooth/WiFi Antenna.
4. Inspect the Bluetooth cable for damage or an open or shorted condition.

Were any problems found?

Yes

- Repair or replace the Bluetooth antenna cable or connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. TEST THE BLUETOOTH ANTENNA

1. Connect the 9977-6-WiFi BT test antenna (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth)
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Cycle the ignition switch from on to off, wait five seconds and then back to on.
5. Adjust the speakers to the front and center.

Is the DTC active?

Yes

- Replace the Radio in accordance with the service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Bluetooth Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

B1434-13-BLUETOOTH ANTENNA - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio in Bluetooth mode.

SET CONDITION

- This DTC sets when the Radio does not detect a Bluetooth Antenna connection for greater than 60 seconds.

POSSIBLE CAUSES

Possible Causes
BAD BLUETOOTH ANTENNA CONNECTION
OPEN BLUETOOTH ANTENNA CABLE
OPEN BLUETOOTH RADIO ANTENNA
RADIO

Always perform the **PRE-PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK THE BLUETOOTH ANTENNA CONNECTION

1. Turn the ignition off.
2. Disconnect the Bluetooth Antenna connector at the back of the Radio.

3. Inspect the Bluetooth Antenna connections.

Are the Bluetooth Antenna connections clean and secure?

Yes

- Go To [2](#)

No

- Repair the Bluetooth Antenna connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

2. CHECK THE BLUETOOTH ANTENNA AND CABLE

1. Connect the 9977-6-WiFi BT (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth)to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Using the scan tool, erase the DTCs.
4. Turn the ignition on.
5. Turn the Radio on.

Did the DTC return?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. TEST THE BLUETOOTH ANTENNA CABLE

1. Disconnect the Bluetooth Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Bluetooth Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Bluetooth Antenna cable at the Bluetooth Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance above 52.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the open/damaged circuit, repair or replace the Bluetooth Antenna cable as necessary.
- Once the repair is complete clear all DTCs.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Bluetooth Antenna base in accordance with the Service Information.
- Once the repair is complete clear all DTCs.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. RADIO

1. Visually inspect the terminal on the radio.
2. Ensure the terminal is clean and free of any corrosion or damage.

- Is the terminal free of corrosion and damage?

Yes

- Go To [5](#)

No

- Repair the terminal as necessary.
- Perform the BODY VERIFICATION TEST.

Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1434-1A-BLUETOOTH ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in bluetooth mode.

SET CONDITION

- This DTC sets when the Radio detects a Bluetooth Antenna connection is shorted to ground

DEFAULT ACTION

- No bluetooth operation.

POSSIBLE CAUSES

Possible Causes
BAD BLUETOOTH ANTENNA CONNECTION
BLUETOOTH ANTENNA CABLE SHORTED TO GROUND
BLUETOOTH ANTENNA SHORTED TO GROUND
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

DIAGNOSTIC TEST

1. CHECK THE BLUETOOTH ANTENNA CONNECTION

1. Turn the ignition off.
2. Disconnect the Bluetooth Antenna connector at the back of the Radio.
3. Inspect the Bluetooth Antenna connections.

Are the Bluetooth Antenna connections clean and secure?

Yes

- Go To [2](#)

No

- Repair the Bluetooth Antenna connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

2. CHECK THE BLUETOOTH ANTENNA AND CABLE

1. Connect the 9977-6-WiFi BT (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Using the scan tool, erase the DTCs.
4. Turn the ignition on.
5. Turn the Radio on.
6. Using the scan tool, read the active Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. TEST THE BLUETOOTH ANTENNA CABLE

1. Disconnect the Bluetooth Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Bluetooth Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Bluetooth Antenna cable at the Bluetooth Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance below 47.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short together, repair or replace the Bluetooth Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Bluetooth Antenna base in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B143A-11-MICROPHONE 1 - CIRCUIT SHORT TO GROUND

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a shorted to ground condition on the hands free Microphone (+) or (-) circuits.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE MICROPHONE (+/-) CIRCUIT SHORTED TO GROUND RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE RELATED MICROPHONE

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Microphone harness connector.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. With the scan tool, read the Radio DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related Microphone in accordance with the Service Information. Refer to **MICROPHONE, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B143A-12-MICROPHONE 1 - CIRCUIT SHORT TO BATTERY

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a short to battery voltage condition on the hands free Microphone (+) or (-) circuits.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE (+/-) CIRCUIT SHORTED TO VOLTAGE RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

4. CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B143A-13-MICROPHONE 1 - CIRCUIT OPEN

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects an open condition on the hands free Microphone (+) or (-) circuits.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE MICROPHONE (+/-) CIRCUIT OPEN RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE OPERATION OF THE RELATED MICROPHONE

NOTE: **Verify the connection of the Microphone harness connector.**

1. Turn the ignition off.
2. Disconnect the Microphone harness connector
3. Connect a jumper wire between the Microphone (+) and the Microphone (-) circuits at the Microphone harness connector.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

7. With the scan tool, read DTCs.

NOTE: **A correlating Microphone Shorted Together circuit DTC should display as active as a result of this test.**

Does the scan tool display the Microphone Circuit Open as active DTC?

Yes

- Replace the Microphone in accordance with the Service Information. Refer to **MICROPHONE, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B143A-1A-MICROPHONE 1 - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects the hands free Microphone (+) circuit is shorted to the (-) circuit.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE MICROPHONE (+) CIRCUIT SHORTED TO THE MICROPHONE (-) CIRCUIT RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE OPERATION OF THE RELATED MICROPHONE

NOTE: **Verify the connection of the Microphone harness connector.**

1. Turn the ignition off.
2. Disconnect the Microphone harness connector.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

6. With the scan tool, read DTCs.

NOTE: **A correlating Microphone Circuit Open DTC should display as active as a result of this test.**

Does the scan tool display the Microphone Circuits Shorted Together as an active DTC?

Yes

- Go To [3](#)

No

- Replace the Microphone in accordance with the Service Information. Refer to [MICROPHONE, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B143D-11 - MICROPHONE 2-CIRCUIT SHORT TO GROUND

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a shorted to ground condition on the hands free Microphone (+) or (-) circuits.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE MICROPHONE (+/-) CIRCUIT SHORTED TO GROUND RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE RELATED MICROPHONE

1. Ensure one of the front doors is still open.
2. With the scan tool, erase the DTCs.
3. Turn the ignition off.
4. Disconnect the related Microphone harness connector.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. With the scan tool, read the Radio DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the related Microphone in accordance with the Service Information. Refer to [MICROPHONE, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B143D-12-MICROPHONE 2 - CIRCUIT SHORT TO BATTERY

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a short to battery voltage condition on the hands free Microphone (+) or (-) circuits.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE (+/-) CIRCUIT SHORTED TO VOLTAGE RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

4. CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.

2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B143D-13-MICROPHONE 2 - CIRCUIT OPEN

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects an open condition on the hands free Microphone (+) or (-) circuits.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE MICROPHONE (+/-) CIRCUIT OPEN RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE OPERATION OF THE RELATED MICROPHONE

NOTE: Verify the connection of the Microphone harness connector.

1. Turn the ignition off.
2. Disconnect the Microphone harness connector
3. Connect a jumper wire between the Microphone (+) and the Microphone (-) circuits at the Microphone harness connector.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

7. With the scan tool, read DTCs.

NOTE: A correlating Microphone Shorted Together circuit DTC should display as active as a result of this test.

Does the scan tool display the Microphone Circuit Open as active DTC?

Yes

- Replace the Microphone in accordance with the Service Information. Refer to [MICROPHONE, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

NOTE: **The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**

8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B143D-1A-MICROPHONE 2 - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete HANDS FREE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects the hands free Microphone (+) circuit is shorted to the (-) circuit.

DEFAULT ACTION

- Microphone is inoperative.

POSSIBLE CAUSES

Possible Causes
MICROPHONE MICROPHONE (+) CIRCUIT SHORTED TO THE MICROPHONE (-) CIRCUIT RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

HANDS FREE MICROPHONE CIRCUITS

Microphone 1

Circuit ID	Circuit Description
X712	(+)
X792	(-)

Microphone 2

Circuit ID	Circuit Description
X722	(+)
X723	(-)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. **NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.**
3. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

8. With the scan tool, read DTCs.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE OPERATION OF THE RELATED MICROPHONE

NOTE: Verify the connection of the Microphone harness connector.

1. Turn the ignition off.
2. Disconnect the Microphone harness connector.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

NOTE: The Radio must be on and a front door must remain open whenever checking or erasing Radio DTCs.

6. With the scan tool, read DTCs.

NOTE: A correlating Microphone Circuit Open DTC should display as active as a result of this test.

Does the scan tool display the Microphone Circuits Shorted Together as an active DTC?

Yes

- Go To [3](#)

No

- Replace the Microphone in accordance with the Service Information. Refer to [MICROPHONE, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE MICROPHONE (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any

possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE MICROPHONE (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RADIO HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1488-00-CABIN EQ MISMATCH PERFORMANCE

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- If the Cabin Equalization Curve number value from the Body Control Module (BCM) is not the same as the Cabin Equalization Curve number stored in the Radio for 10 consecutive cycles, then the Radio will set this DTC.

DEFAULT ACTION

- Reduced audio quality.

POSSIBLE CAUSES

Possible Causes
INCORRECT CONFIGURATION

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE CABIN EQUALIZATION CURVE NUMBER

1. With the scan tool in the BCM ECU Details Tab, Configuration button, record the Cabin Equalization Curve number.
2. With the scan tool in the Radio ECU Details Tab, Configuration button, record the True value.

NOTE: The Cabin EQ Curve value found in the BCM should match the True value found in the Radio.

Do the Cabin EQ settings match one another?

Yes

- Replace the Radio in accordance to the service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. VERIFY COMMUNICATION WITH BCM

1. With the scan tool, read the active modules on the BUS.

Does the scan tool show the BCM active on the BUS?

Yes

- Go To [4](#)

No

- Perform the No Response From ECU diagnostic procedure. Refer to **NO RESPONSE FROM ECU** .

4. CHECK THE BCM FOR ACTIVE DTCs

1. With the scan tool, erase BCM DTCs.
2. Turn the ignition off. Wait approximately 10 seconds.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs and record them on the repair order.

Are any active DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1494-00-APP FAILED TO LOAD

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio has detected an application has not loaded from an external device (phone, ipod etc.).

DEFAULT ACTION

- Reduced audio quality.

POSSIBLE CAUSES

Possible Causes
INCORRECT CONFIGURATION

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Replace the Radio in accordance to the service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B1498-13-USB HUB-CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

For a complete AUDIO SYSTEM MEDIA PORT BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio detects a fault with the USB hub / Media port cable.

DEFAULT ACTION

- The USB hub / Media port is inoperative.

POSSIBLE CAUSES

Possible Causes
USB HUB / MEDIA PORT CABLE
USB HUB / MEDIA PORT
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go to [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE USB/MEDIA PORT CABLE

NOTE: Confirm the USB/Media port cable is connected to the Radio and USB/Media port before proceeding with this diagnostic.

1. Disconnect the USB/Media port cable at the Radio.
2. Disconnect the USB/Media port cable at the USB/Media port.
3. From the 9977-6-11 Radio Antenna Diagnostic Kit (special tool #9977-6-11, Kit, USB Mini-B - 4 and 5 Wire) connect the appropriate length adapter cable between the Radio and USB Port.
4. With the scan tool, erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. With the scan tool, read the Radio DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the USB hub / Media Port Cable for damage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE MEDIA PORT

NOTE: This test is designed to validate the ability of the Audio/Media system to play audio from a customer's device that has been connected to the USB port on the radio or the external USB port (Universal Customer Interface (UCI) / Multi- Media port). By connecting a known good compatible device to the USB ports it will also determine if the USB port can provide power to a connected device.

It is important to determine the system features supported by the vehicle's multi-media systems, customer's personal device and their compatibility with another.

For device compatibility, refer to <http://www.driveuconnect.com>

Prior to performing any testing of the multi-media systems, the compatibility between the customer's personal device and the vehicle's multi-media systems must be confirmed.

1. Confirm the USB port is not a **Charge only** port.
2. Using a known good USB Cable, connect the USB Cable to the vehicle's USB port.
3. Connect the USB Cable to the known good compatible device.
4. Select and audio file from the known good compatible device to be heard with the volume all the way up.
5. Using the vehicle controls, place the audio system into USB Mode. (Audio system may automatically enter into USB Mode.)

Does the Radio play audio from the known good compatible device?

Yes

- Go To [4](#)

No

- Replace the Media Port in accordance with the Service Information. Refer to [MEDIA HUB, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

For a complete AUDIO SYSTEM MEDIA PORT BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Radio detects an internal fault with the USB hub / Media port.

DEFAULT ACTION

- USB hub/Media port inoperative.

POSSIBLE CAUSES

Possible Causes
USB HUB / MEDIA PORT CABLE
USB HUB / MEDIA PORT
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. With the scan tool, read the Radio DTCs.

Is the DTC active?

Yes

- Go to [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE USB/MEDIA PORT CABLE

1. Disconnect the USB/Media port cable at the Radio.
2. Disconnect the USB/Media port cable at the USB/Media port.
3. From the 9977-6-11 Radio Antenna Diagnostic Kit (special tool #9977-6-11, Kit, USB Mini-B - 4 and 5 Wire) connect the appropriate length adapter cable between the Radio and USB Port.
4. With the scan tool, erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. With the scan tool, read the Radio DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the USB hub / Media Port Cable for damage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE MEDIA PORT

NOTE: This test is designed to validate the ability of the Audio/Media system to play audio from a customer's device that has been connected to the USB port on the radio or the external USB port (Universal Customer Interface (UCI) / Multi- Media port). By connecting a known good compatible device to the USB ports it will also determine if the USB port can provide power to a connected device.

It is important to determine the system features supported by the vehicle's multi-media systems, customer's personal device and their compatibility with another.

For device compatibility, refer to <http://www.driveuconnect.com>

Prior to performing any testing of the multi-media systems, the compatibility between the customer's personal device and the vehicle's multi-media systems must be confirmed.

1. Confirm the USB port is not a **Charge only** port.
2. Using a known good USB Cable, connect the USB Cable to the vehicle's USB port.
3. Connect the USB Cable to the known good compatible device.
4. Select and audio file from the known good compatible device to be heard with the volume all the way up.
5. Using the vehicle controls, place the audio system into USB Mode. (Audio system may automatically enter into USB Mode.)

Does the Radio play audio from the known good compatible device?

Yes

- Replace the Radio in accordance with the Service Information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Replace the Media Port in accordance with the Service Information. Refer to [**MEDIA HUB, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B14DA-2A-HEAD UNIT BUTTON - STUCK

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio active on the bus.

SET CONDITION

- In vehicles built **without** a disassociated touchscreen display the Radio detects a closed switch. In vehicles built **with** a disassociated touchscreen display the Radio receives a bussed input for a closed switch.

DEFAULT ACTION

- Push-button commands ignored by the Radio.

POSSIBLE CAUSES

Possible Causes
INTEGRATED CENTER STACK (ICS) RELATED DTCS
STEERING COLUMN CONTROL MODULE (SCCM) RELATED DTCS
DIRT, FOREIGN OBJECTS, STICKY SUBSTANCE, OR PHYSICAL DAMAGE TO BUTTON(S)
ICS
SCCM
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. Turn the Radio on and set the volume to 25.
7. Adjust the speakers to the front and center.
8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals and correct pin tension.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

2. DETERMINE THE VEHICLE CONFIGURATION

1. Review the Radio sales codes and display screen to determine the vehicle audio system configuration.

Is the vehicle equipped with a disassociated / separate touchscreen display?

Yes

- Go To [4](#)

No

- Go To [3](#)

3. VERIFY OPERATION OF THE BUTTON

1. With the scan tool, read DTCs and record on repair order.
2. With the scan tool, erase DTCs.
3. Press and release all the Radio hard and soft keys three times.
4. Wait 60 seconds.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service Information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE INTEGRATED CENTER STACK (ICS)

1. With the scan tool, read the ICS DTCs.

NOTE: **The ICS is capable of setting a similar type DTC for B157F-2A-BUTTON/KNOB - STUCK**

Does the ICS have DTCs?

Yes

- Refer to - DTC-Based Diagnostics/MODULE, Integrated Center Stack (ICS) Diagnosis and Testing.

No

- Go To [5](#)

5. CHECK THE STEERING COLUMN CONTROL MODULE (SCCM)

1. With the scan tool, read the SCCM DTCs.

NOTE: **The SCCM is capable of setting a similar type DTC for B1425-2A-REMOTE RADIO SWITCH INPUT - STUCK**

Does the SCCM have DTCs?

Yes

- Refer to DTC-Based Diagnostics/MODULE, Steering Column Control) Diagnosis and Testing.

No

- Go To [6](#)

6. CHECK THE ICS AND STEERING WHEEL SWITCH BUTTONS

1. Carefully check the ICS and Steering Wheel Switch buttons by pressing and releasing each button for the following:
 - Debris (Dirt, Foreign Objects, Sticky Substances, etc.) that may be causing the button(s) to remain in a pressed state.
 - Physical damage to the buttons.

Do the buttons show any of the above noted?

Yes

- IF needed - replace the ICS in accordance with the Service Information, refer to - Electronic Control Modules / MODULE, Integrated Center Stack (ICSM) / Removal and Installation.

- IF needed - replace the Steering Wheel Switches in accordance with the Service Information, refer to - Audio/Video/Entertainment/Connectivity / SWITCH, Remote Radio / Removal and Installation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK THE RADIO BUSSED INPUTS

1. Do not press any buttons in **or** on the vehicle during this portion.
2. With the scan tool, check the Radio data tab for each bussed input value / status for the following:

NOTE: Those bussed inputs to the Radio with a SWS designation originate from the Steering Wheel Switches on LIN bus to the SCCM. The other bussed inputs are through the Integrated Center Stack.

- Pressed or Not Pressed (ICS)
- Active or Not Active (SCCM)

Does the scan tool show a "Pressed" or "Active" bussed input value / status in the Radio data?

Yes

- Go To [9](#)

No

- Go To [8](#)

8. CHECK THE ASSOCIATED ECU

1. Turn the ignition off.
2. Based on the information found in STEP, REMOVE THE RELATED ECU found from communicating on the CAN bus to confirm as the possible cause:

NOTE: An ECU will stop communicating on a CAN bus by removing its power(s), ground(s), or disconnecting the ECU.

- ICS - Integrated Center Stack
- SCCM - Steering Column Control Module

NOTE: Communication DTCs (i.e. Loss of Com, Implausible, Invalid) may appear for those ECUs that are removed from communicating on the CAN bus.

3. Turn the ignition on
4. With the scan tool, check the Radio data tab for each bussed input value / status for the following:

NOTE: Those bussed inputs to the Radio with a SWS designation originate from the Steering Wheel Switches on LIN bus to the SCCM. The other bussed inputs are through the Integrated Center Stack.

- Pressed or Not Pressed (ICS)
- Active or Not Active (SCCM)

Did the bussed input value / status in the Radio data change to "Not Pressed" or "Not Active"?

Yes

- Replace the related ECU in accordance with Service Information
 - For the ICS refer to - Electronic Control Modules / MODULE, Integrated Center Stack (ICSM) / Removal and Installation.
 - For the SCCM refer to - Electronic Control Modules / MODULE, Steering Column Control (SCCM) / Removal and Installation.
 - Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Replace the Radio in accordance with the Service Information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

9. CHECK THE ASSOCIATED ECUS FOR POSSIBLE CAUSE

1. Turn the ignition off.
2. The following ECUs listed below will need to be removed (**one at a time**) from communicating on the CAN bus to determine the ECU as the possible cause:

NOTE: An ECU will stop communicating on a CAN bus by removing its power(s), ground(s), or disconnecting the ECU.

- ICS - Integrated Center Stack
- SCCM - Steering Column Control Module

NOTE: Communication DTCs (i.e. Loss of Com, Implausible, Invalid) may appear for those ECUs that are removed from communicating on the CAN bus.

3. Turn the ignition on
4. With the scan tool, check the Radio data tab for each bussed input value / status for the following:

NOTE: Those bussed inputs to the Radio with a SWS designation originate from the Steering Wheel Switches. The other bussed inputs are through the Integrated Center Stack.

- Pressed or Not Pressed
 - Active or Not Active (SWS related only)
5. Repeat the above sub steps 1 - 4 of Step 9 for the remaining ECU.

Which ECU when disconnected changed the "Pressed" or "Active" bussed input value / status in the Radio data to "Not Pressed" or "Not Active"?

ICS

- Replace the ICS in accordance with the Service Information. refer to - Electronic Control Modules / MODULE, Integrated Center Stack (ICSM) / Removal and Installation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

SCCM

- Replace the SCCM in accordance with the Service Information, refer to - Electronic Control Modules / MODULE, Steering Column Control (SCCM) / Removal and Installation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

NEITHER

- Replace the Radio in accordance with the Service Information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1560-11-CELLULAR ANTENNA 1-CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in cellular mode.

SET CONDITION

- This DTC sets when the Radio detects a Cellular Antenna connection is shorted to ground

DEFAULT ACTION

- No cellular operation.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION CELLULAR ANTENNA CABLE CELLULAR ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Cellular Antenna connector at the Antenna.
3. Disconnect the Cellular Antenna connector at the rear of the Radio.
4. Inspect both of the Cellular Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Cellular Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) to the Cellular Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go to [6](#)

No

- Go To [5](#)

5. TEST THE CELLULAR ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles Cellular Antenna cable at the Cellular Antenna.

NOTE: Special tool 9977-6-13 should still be connected at the back of the Radio during this test.

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles Cell Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Cellular Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1560-13-CELLULAR ANTENNA 1-CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio in Cellular mode.

SET CONDITION

- This DTC sets when the Radio does not detect a Cellular Antenna connection.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION CELLULAR ANTENNA CABLE CELLULAR ANTENNA RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Cellular Antenna connector at the Antenna.
3. Disconnect the Cellular Antenna connector at the rear of the Radio.
4. Inspect both of the Cellular Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Cellular Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**
must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) to the Cellular Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE CELLULAR ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles Cellular Antenna cable at the Cellular Antenna.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the Radio during this test.**

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles Cell Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Cellular Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1561-11-CELLULAR ANTENNA 2-CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information .**

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in cellular mode.

SET CONDITION

- This DTC sets when the Radio detects a Cellular Antenna connection is shorted to ground

DEFAULT ACTION

- No cellular operation.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION CELLULAR ANTENNA CABLE CELLULAR ANTENNA RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Cellular Antenna connector at the Antenna.
3. Disconnect the Cellular Antenna connector at the rear of the Radio.
4. Inspect both of the Cellular Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Cellular Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**
must
be done outside and away from man made structures or natural features
to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) to the Cellular Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE CELLULAR ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles Cellular Antenna cable at the Cellular Antenna.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the Radio during this test.**

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-5, Adapter) to the vehicles Cell Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Cellular Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio in Cellular mode.

SET CONDITION

- This DTC sets when the Radio does not detect a Cellular Antenna connection.

DEFAULT ACTION

- No cellular operation.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
CELLULAR ANTENNA CABLE
CELLULAR ANTENNA
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.

8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Cellular Antenna connector at the Antenna.
3. Disconnect the Cellular Antenna connector at the rear of the Radio.
4. Inspect both of the Cellular Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Cellular Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) to the Cellular Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE CELLULAR ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles Cellular Antenna cable at the Cellular Antenna.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the Radio during this test.**

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-5, Adapter) to the vehicles Cell Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Cellular Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio in navigation mode.

SET CONDITION

- This DTC sets when the Radio detects a Global Positioning System (GPS) Antenna connection is shorted to ground.

DEFAULT ACTION

- GPS inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
GPS ANTENNA CABLE
GPS ANTENNA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the GPS Antenna connector at the Antenna.
3. Disconnect the GPS Antenna connector at the rear of the Radio.
4. Inspect both of the GPS Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the GPS Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing must be done outside and away from man made structures or natural features to ensure all signals are not obstructed.**

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) to the GPS Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE GPS ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles GPS Antenna cable at the GPS Antenna.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the Radio during this test.**

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles GPS Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in navigation mode.

SET CONDITION

- This DTC sets when the Radio detects a Global Positioning System (GPS) Antenna connection is shorted to battery.

DEFAULT ACTION

- GPS inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
GPS ANTENNA CABLE
GPS ANTENNA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the GPS Antenna connector at the Antenna.
3. Disconnect the GPS Antenna connector at the rear of the Radio.
4. Inspect both of the GPS Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the GPS Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **If the vehicle is equipped with satellite audio, a combined antenna for satellite and navigation is used.**

NOTE: **Antenna reception testing
must**

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) to the GPS Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE GPS ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles GPS Antenna cable at the GPS Antenna.

NOTE: Special tool 9977-6-13 should still be connected at the back of the Radio during this test.

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles GPS Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1562-13-GPS ANTENNA - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information .**

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio in navigation mode.

SET CONDITION

- This DTC sets when the Radio does not detect a Global Positioning System (GPS) Antenna connection.

DEFAULT ACTION

- GPS inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
GPS ANTENNA CABLE
GPS ANTENNA
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the GPS Antenna connector at the Antenna.
3. Disconnect the GPS Antenna connector at the rear of the Radio.
4. Inspect both of the GPS Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the GPS Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing must be done outside and away from man made structures or natural features to ensure all signals are not obstructed.**

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) to the GPS Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE GPS ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles GPS Antenna cable at the GPS Antenna.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the Radio during this test.**

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles GPS Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in navigation mode.

SET CONDITION

- This DTC sets when the Radio detects a Global Positioning System (GPS) Antenna connection is shorted together.

DEFAULT ACTION

- GPS inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
GPS ANTENNA CABLE
GPS ANTENNA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
 4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
 5. Turn the ignition off for a minimum of 10.0 seconds.
 6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the GPS Antenna connector at the Antenna.
3. Disconnect the GPS Antenna connector at the rear of the Radio.
4. Inspect both of the GPS Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the GPS Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. GPS OPERATION

NOTE: **Antenna reception testing**
must
be done outside and away from man made structures or natural features
to ensure all signals are not obstructed.

Does the GPS function properly?

Yes

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

NOTE: **If the vehicle is equipped with satellite audio, a combined antenna for satellite and navigation is used.**

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) to the GPS Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [7](#)

No

- Go To [6](#)

6. TEST THE GPS ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the vehicles GPS Antenna cable at the GPS Antenna.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the Radio during this test.**

3. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles GPS Antenna.
4. Make sure one of the front doors is still open.
5. Turn the ignition on.
6. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
7. Turn the ignition off for a minimum of 10.0 seconds.
8. Turn the ignition on.
9. Turn the Radio on.
10. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.

10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B156B-11 SATELLITE RADIO ANTENNA-CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in satellite mode.

SET CONDITION

- This DTC sets when the Radio detects a Satellite Antenna connection is shorted to ground.

Set Conditions:

- Satellite Radio inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION SATELLITE ANTENNA CABLE

Possible Causes
SATELLITE ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to **ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Satellite Radio Antenna connector at the Antenna.

3. Disconnect the Satellite Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Satellite Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Satellite Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) to the Satellite Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

NOTE: **While using the 9977-6-SATXM test antenna the GPS reception will not be available and GPS faults may occur. The 9977-6-SATXM test tool will only enable satellite radio reception to work. For GPS reception concerns use test antenna 9977-6-GPS-GLO.**

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE SATELLITE ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.

NOTE: Special tool 9977-6-13 should still be connected at the back of the Radio during this test.

2. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles Satellite Antenna.
3. Make sure one of the front doors is still open.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on.
9. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B156B-12 SATELLITE RADIO ANTENNA-CIRCUIT SHORT TO BATTERY

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in satellite mode.

SET CONDITION

- This DTC sets when the Radio detects a Satellite Antenna connection is shorted to battery.

Set Conditions:

- Satellite Radio inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION SATELLITE ANTENNA CABLE SATELLITE ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to **ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Satellite Radio Antenna connector at the Antenna.
3. Disconnect the Satellite Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Satellite Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Satellite Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) to the Satellite Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

NOTE: **While using the 9977-6-SATXM test antenna the GPS reception will not be available and GPS faults may occur. The 9977-6-SATXM test tool will only enable satellite radio reception to work. For GPS reception concerns use test antenna 9977-6-GPS-GLO.**

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE SATELLITE ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.

NOTE: Special tool 9977-6-13 should still be connected at the back of the Radio during this test.

2. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles Satellite Antenna.
3. Make sure one of the front doors is still open.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on.
9. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B156B-13-SATELLITE RADIO ANTENNA - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in satellite mode.

SET CONDITION

- This DTC sets when the Radio does not detect a Satellite Antenna connection.

Set Conditions:

- Satellite Radio inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION SATELLITE RADIO ANTENNA CABLE SATELLITE RADIO ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Satellite Radio Antenna connector at the Antenna.
3. Disconnect the Satellite Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Satellite Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Satellite Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) to the Satellite Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

NOTE: **While using the 9977-6-SATXM test antenna the GPS reception will not be available and GPS faults may occur. The 9977-6-SATXM test tool will only enable satellite radio reception to work. For GPS reception concerns use test antenna 9977-6-GPS-GLO.**

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE SATELLITE ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.

NOTE: Special tool 9977-6-13 should still be connected at the back of the Radio during this test.

2. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles Satellite Antenna.
3. Make sure one of the front doors is still open.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on.
9. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B156B-1A-SATELLITE RADIO ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio in satellite mode.

SET CONDITION

- This DTC sets when the Radio detects a Satellite Antenna is shorted together.

DEFAULT ACTION

- Satellite radio is inoperative.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION SATELLITE ANTENNA CABLE SATELLITE ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on and set the volume to 25.
9. Adjust the speakers to the front and center.
10. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.

2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [**ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Satellite Radio Antenna connector at the Antenna.
3. Disconnect the Satellite Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Satellite Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the Satellite Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) to the Satellite Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read Radio DTCs.

NOTE: **While using the 9977-6-SATXM test antenna the GPS reception will not be available and GPS faults may occur. The 9977-6-SATXM test tool will only enable satellite radio reception to work. For GPS reception concerns use test antenna 9977-6-GPS-GLO.**

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE SATELLITE ANTENNA CABLE

NOTE: **Antenna reception testing
must**

**be done outside and away from man made structures or natural features
to ensure all signals are not obstructed.**

1. Turn the ignition off.

NOTE: **Special tool 9977-6-13 should still be connected at the back of the
Radio during this test.**

2. Connect the (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to the vehicles Satellite Antenna.
3. Make sure one of the front doors is still open.
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on.
9. Using the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Use the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) to locate the open circuit, repair or replace the Satellite Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B156D-00-LOW VOLTAGE DIFFERENTIAL SIGNAL (LVDS) VIDEO CABLE

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

For a complete BACK UP CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media

sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage between 9.0-16.0 volts.

SET CONDITION

- The Radio detects that the Low Voltage Differential Signal (LVDS) Video Cable is disconnected for greater than 10 seconds.

DEFAULT ACTION

- The Radio display screen is blue with no input message.

POSSIBLE CAUSES

Possible Causes
LOW VOLTAGE DIFFERENTIAL SIGNAL (LVDS) VIDEO CABLE DISCONNECTED OR DAMAGED REAR CAMERA MODULE CENTRAL VISION PROCESSING MODULE (CVPM) RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
 4. With the scan tool, perform an ECU reset to the Radio and CVPM (if equipped), and then erase DTCs.
 5. Turn the ignition off for a minimum of 10.0 seconds.
 6. Turn the ignition on.
 7. Turn the Radio on and set the volume to 25.
 8. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE VEHICLE CONFIGURATION

1. Review the vehicle sales codes to determine the vehicle configuration.

Sales Code	Description
XAC	Parkview Rear Back-Up Camera
OR	
XAK	Surround View Camera System

Which sales code is the vehicle built with?

XAC (Parkview Rear Back-Up Camera)

- Go To [3](#)

XAK (Surround View Camera System)

- Go To [8](#)

3. CHECK THE (J220) LVDS / COAX CABLE CONNECTION AT THE REAR CAMERA MODULE

1. Previous Step Refer to [2](#).
2. Turn the ignition off.
3. Inspect the cable connection at the Rear Camera Module.

Is the cable connection secure and undamaged?

Yes

- Go To [4](#)

No

- Repair the cable connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE (J220) LVDS / COAX CABLE CONNECTION AT THE RADIO

1. Inspect the cable connection at the rear of the Radio.

Is the video cable connection secure and undamaged?

Yes

- Go To [5](#)

No

- Repair the video cable connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. TEST THE (J220) LVDS / COAX CABLE

1. Connect the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) between the Radio and Rear Camera Module.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Replace the Low Voltage Differential Signal (LVDS) Video Cable in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. TEST THE RADIO

NOTE: To continue with this test, you must secure a Known Good Radio.

1. Turn the ignition off.
2. Connect a known good Radio to the LVDS cable.
3. With the scan tool, erase DTCs.
4. With the scan tool, perform the **Reset ECU** function under the Guided Diagnostics menu.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Rear Camera Module in accordance with the Service Information. Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

8. CHECK THE (J228) LVDS / COAX CABLE CONNECTION AT THE CENTRAL VISION PROCESSING MODULE (CVPM)

1. Previous Step Refer to [2](#).
2. Turn the ignition off.
3. Inspect the cable connection at the CVPM.

Is the cable connection secure and undamaged?

Yes

- Go To [9](#)

No

- Repair the cable connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

9. CHECK THE (J228) LVDS / COAX CABLE CONNECTION AT THE RADIO

1. Inspect the cable connection at the rear of the Radio.

Is the video cable connection secure and undamaged?

Yes

- Go To [10](#)

No

- Repair the video cable connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

10. TEST THE (J228) LVDS / COAX CABLE

1. Connect the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) between the Radio and Rear Camera Module.
2. Turn the ignition on.
3. With the scan tool, perform an ECU reset to the Radio and CVPM, and then erase DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Go To [11](#)

No

- Replace the Low Voltage Differential Signal (LVDS) Video Cable in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

11. TEST THE RADIO

NOTE: To continue with this test, you must secure a Known Good Radio.

1. Turn the ignition off.
2. Connect a known good Radio to the LVDS cable.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio and CVPM, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Central Vision Processing Module in accordance with the Service Information. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [12](#)

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio and CVPM, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a problem with the WIFI antenna.

DEFAULT ACTION

- No Bluetooth operation.

POSSIBLE CAUSES

Possible Causes
WIFI ANTENNA RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, record and erase the Radio DTCS.

5. Cycle the ignition switch from on to off, wait five seconds and then back to on.

6. Turn the Radio on and set the volume to 25.

7. Adjust the speakers to the front and center.

8. With the scan tool, read the active Radio DTCS.

NOTE:

A front door must remain open whenever checking or erasing Radio DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE WIFI CABLE CONNECTION AT THE RADIO

1. Turn the ignition off.
2. Inspect the WIFI cable connection at the rear of the Radio.

Is the WIFI cable connection secure and undamaged?

Yes

- Go To [3](#)

No

- Repair or replace the WIFI antenna cable connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. TEST THE WIFI ANTENNA

1. Connect the 9977-6-WIFI-BT WiFi Blue Tooth Antenna (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth) test tool to the Radio.
2. With the scan tool, erase DTCs.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Replace the WIFI Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B156F-1A-WIFI ANTENNA-CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming. The Radio is capable of using AM/FM, Cellular, Global Positioning System (GPS) and Satellite Radio signals depending upon the audio system/vehicle configuration.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Radio detects a problem with the WIFI antenna.

DEFAULT ACTION

- No Bluetooth operation.

POSSIBLE CAUSES

Possible Causes
WIFI ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on and open one of the front doors.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

2. With the scan tool, read Radio DTCs and record on the repair order.
3. With the scan tool, erase DTCs.
4. Cycle the ignition switch from on to off, wait five seconds and then back to on.
5. Adjust the speakers to the front and center.
6. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE WIFI CABLE CONNECTION AT THE RADIO

1. Turn the ignition off.
2. Inspect the WIFI cable connection at the rear of the Radio.

Is the WIFI cable connection secure and undamaged?

Yes

- Go To [3](#)

No

- Repair or replace the WIFI antenna cable connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. TEST THE WIFI ANTENNA

1. Connect the 9977-6-WIFI-BT WiFi Blue Tooth Antenna (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth) test tool to the Radio.
2. With the scan tool, erase DTCs.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Radio in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the WIFI Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1570-19-USB COMMUNICATION - OVERCURRENT

For a complete AUDIO SYSTEM MEDIA PORT BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- This DTC will set by connecting an unsupported USB device into the USB port for greater than 10 seconds.

DEFAULT ACTION

- USB inoperative.

POSSIBLE CAUSES

Possible Causes
DAMAGED OR UNSUPPORTED USB DEVICE
DAMAGED OR UNSUPPORTED USB CABLE
MEDIA PORT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, record and erase the Radio DTCs.
5. Cycle the ignition switch from on to off, wait five seconds and then back to on.
6. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE CONNECTORS AND HARNESS

1. Turn the ignition off.
2. Disconnect the USB harness connector at the back of the radio.
3. Inspect the connectors and harness between the USB port and the radio.

Are there any issues with the harness or connectors?

Yes

- Repair or replace as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE MEDIA PORT

NOTE: **This test is designed to validate the ability of the Audio/Media system to play audio from a customer's device that has been connected to the USB port on the radio or the external USB port (Universal Customer Interface (UCI) / Multi- Media port). By connecting a known good compatible device to the USB ports it will also determine if the USB port can provide power to a connected device.**

It is important to determine the system features supported by the vehicle's multi-media systems, customer's personal device and their compatibility with another.

For device compatibility, refer to <http://www.driveuconnect.com>

Prior to performing any testing of the multi-media systems, the compatibility between the customer's personal device and the vehicle's multi-media systems must be confirmed.

1. Confirm the USB port is not a **Charge only** port.
2. Using a known good USB Cable, connect the USB Cable to the vehicle's USB port.
3. Connect the USB Cable to the known good compatible device.
4. Select and audio file from the known good compatible device to be heard with the volume all the way up.
5. Using the vehicle controls, place the audio system into USB Mode. (Audio system may automatically enter into USB Mode.)

Does the Radio play audio from the known good compatible device?

Yes

- Go To [4](#)

No

- Replace the Media Port in accordance with the Service Information. Refer to [MEDIA HUB, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1578-11 - AUDIO ANTENNA - CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

- If the ignition is on.
- If battery voltage is within 9 V and 16 V.

SET CONDITION

- If the Radio detects voltage sensed on the antenna is of 0 V.

DEFAULT ACTION

- No reception on AM/FM signal.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION AUDIO ANTENNA CIRCUIT AUDIO ANTENNA

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Antenna in accordance with the Service Information. Refer to **BODY AND CABLE, ANTENNA, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.

4. Inspect both of the Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Go To [7](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance below 47.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short to battery in the circuit, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK THE AUDIO ANTENNA

1. Turn the ignition off.
2. Replace the audio antenna for a known good one (replacement for test).
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Operate the vehicle in the conditions that set this DTC.
8. With the scan tool, read DTCs from the Radio.

Did the DTC return?

Yes

- Replace the audio antenna in accordance with Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1578-12 - AUDIO ANTENNA - CIRCUIT SHORT TO VOLTAGE

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

- If the ignition is on.
- If battery voltage is within 9 V and 16 V.

SET CONDITION

- If the Radio detects voltage sensed on the antenna is of 8 V or more and current sensed on it is 5 mA or less.

DEFAULT ACTION

- No reception on AM/FM signal.

POSSIBLE CAUSES

Possible Causes
AUDIO ANTENNA CIRCUIT AUDIO ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. Turn the ignition on.
5. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Turn the Radio on and set the volume to 25.
9. Adjust the speakers to the front and center.
10. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Antenna in accordance with the Service Information. Refer to **BODY AND CABLE, ANTENNA, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Go To [7](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance below 47.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short to battery in the circuit, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK THE AUDIO ANTENNA

1. Turn the ignition off.
2. Replace the audio antenna for a faultless one (replacement for test).
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Operate the vehicle in the conditions that set this DTC.
8. With the scan tool, read DTCs from the Radio.

Did the DTC return?

Yes

- Replace the audio antenna in accordance with Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1578-13-AM/FM ANTENNA - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in seek mode.

SET CONDITION

- With the Radio in seek mode for two minutes and the Radio does not detect an Antenna connection or does not receive a Radio station signal.

DEFAULT ACTION

- Poor or no radio reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
ANTENNA CABLE
ANTENNA
RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Antenna in accordance with the Service Information. Refer to **BODY AND CABLE, ANTENNA, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-FM, Antenna) to the Antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Disconnect the Antenna cable at the base.
3. Connect the appropriate Radio Diagnostic Tool (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
4. Connect the appropriate Radio Diagnostic Tool (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
5. Measure the Resistance across the tool terminals.

Is the resistance above 52.5 Ohms?

Yes

- Use the Radio Diagnostic Tool (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the open circuit, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Antenna base in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1578-1A-AM/FM AUDIO ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Radio in seek mode.

SET CONDITION

- The Radio detects that the Antenna circuit is shorted together.

DEFAULT ACTION

- Poor or no radio reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION ANTENNA CABLE ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Antenna in accordance with the Service Information. Refer to **BODY AND CABLE, ANTENNA, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Radio Antenna connector at the Antenna.
3. Disconnect the Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance below 47.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short together, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Antenna base in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1579-11 DIVERSITY ANTENNA-CIRCUIT SHORT TO GROUND

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On
- Radio in SEEK mode

SET CONDITION

- The Radio does not detect the FM2 Diversity Antenna connection or does not receive a radio station signal.

DEFAULT ACTION

- Poor or no Radio reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION DIVERSITY ANTENNA CABLE DIVERSITY ANTENNA RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the FM2 Diversity Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the FM2 Diversity Antenna connector at the Antenna.
3. Disconnect the FM2 Diversity Antenna connector at the rear of the Radio.
4. Inspect both of the FM2 Diversity Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the FM2 Diversity Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance above 52.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short to ground in the circuit, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Antenna base in accordance with the Service Information.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1579-12 DIVERSITY ANTENNA-CIRCUIT SHORT TO BATTERY

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On
- Radio in SEEK mode

SET CONDITION

- The Radio does not detect the FM2 Diversity Antenna connection or does not receive a radio station signal.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION DIVERSITY ANTENNA CABLE DIVERSITY ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCS.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE ANTENNA CONNECTION

1. Turn the ignition off.
2. Disconnect the FM2 Diversity Antenna connector at the back of the Radio.
3. Inspect the FM2 Diversity Antenna connections.

Are the Antenna connections clean and secure?

Yes

- Go To [3](#)

No

- Repair the Antenna connection as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the FM2 Diversity Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the FM2 Diversity Antenna connector at the Antenna.
3. Disconnect the FM2 Diversity Antenna connector at the rear of the Radio.
4. Inspect both of the FM2 Diversity Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [5](#)

No

- Clean the FM2 Diversity Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK THE ANTENNA AND CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. Using the scan tool, read the active Radio DTCs.

Is the DTC active?

Yes

- Replace the Radio in accordance with the Service Information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

6. TEST THE ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance below 47.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short to battery in the circuit, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Replace the Antenna base in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1579-13 DIVERSITY ANTENNA - CIRCUIT OPEN

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On
- Radio in SEEK mode

SET CONDITION

- The Radio does not detect the FM2 Diversity Antenna connection or does not receive a radio station signal.

DEFAULT ACTION

- Poor or no radio reception

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION
DIVERSITY ANTENNA CABLE
DIVERSITY ANTENNA
RADIO

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCs.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on and set the volume to 25.
8. Adjust the speakers to the front and center.
9. With the scan tool, read the active Radio DTCs.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCs.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the FM2 Diversity Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the FM2 Diversity Antenna connector at the Antenna.
3. Disconnect the FM2 Diversity Antenna connector at the rear of the Radio.
4. Inspect both of the FM2 Diversity Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the FM2 Diversity Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance above 52.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the open circuit, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Antenna base in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Presence of foreign conductive materials on connector pins and terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to **RADIO, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1579-1A DIVERSITY ANTENNA - CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Radio manages the hands-free, navigation, and satellite functions of the vehicle. The Radio becomes operational after receiving a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is On. Depending upon audio system options, the Radio can play audio from many different media sources, such as the 3.5 millimeter auxiliary (AUX) port, a universal serial bus (USB) port or through wireless Bluetooth™ audio streaming.

Make sure any serviced speakers are similar to the one being removed. The Radio uses the vehicle build configuration data (based upon sales code) to determine the audio configuration.

For additional information regarding the description and operation of the Audio System. Refer to [**DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on
- Radio in SEEK mode

SET CONDITION

- The Radio detects that the FM2 Diversity Antenna circuit is shorted together.

DEFAULT ACTION

- Limited or no reception.

POSSIBLE CAUSES

Possible Causes
BAD ANTENNA CONNECTION DIVERSITY ANTENNA CABLE DIVERSITY ANTENNA RADIO

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. **NOTE: A front door must remain open whenever checking or erasing Radio DTCS.**

4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCS.

5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.

7. Turn the Radio on and set the volume to 25.

8. Adjust the speakers to the front and center.

9. With the scan tool, read the active Radio DTCS.

NOTE: **A front door must remain open whenever checking or erasing Radio DTCS.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the FM2 Diversity Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the FM2 Diversity Antenna connector at the Antenna.
3. Disconnect the FM2 Diversity Antenna connector at the rear of the Radio.
4. Inspect both of the FM2 Diversity Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [4](#)

No

- Clean the FM2 Diversity Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE ANTENNA AND CABLE

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the (special tool #9977-6-FM, Antenna) to the antenna connection on the back of the Radio.
2. Make sure one of the front doors is still open.
3. Turn the ignition on.
4. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.

5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Turn the Radio on.
8. With the scan tool, read Radio DTCs.

Is the DTC active?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. TEST THE ANTENNA CABLE

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Disconnect the Antenna cable at the base.
2. Connect the appropriate (special tool #9977-6-1, Adapter) or (special tool #9977-6-3, Adapter) to the Antenna cable at the back of the Radio.
3. Connect the appropriate (special tool #9977-6-4, Jumper) or (special tool #9977-6-2, Jumper) to the Antenna cable at the Antenna base.
4. Measure the Resistance across the tool terminals.

Is the resistance below 47.5 Ohms?

Yes

- Use the (special tool #9977-6, Kit, Radio Antenna Diagnostic) to locate the short together, repair or replace the Antenna cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Antenna base in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Presence of foreign conductive materials on connector pins and terminals.
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Turn the ignition on.
9. With the scan tool, perform an ECU reset to the Radio, and then erase DTCs.
10. Turn the ignition off for a minimum of 10.0 seconds.
11. Turn the ignition on.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read Radio DTCs.

Did the DTC return?

Yes

- Replace the Radio in accordance with the Service information. Refer to [**RADIO, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
 - Test complete.
-

2021 ACCESSORIES AND EQUIPMENT

Audio/Video - Non-DTC Based Diagnostics - Gladiator

DIAGNOSIS AND TESTING

GLOBAL RADIO MATRIX - 2020

REFRESH - RADIO - MATRIX

NA (North America)																												
UAA - 5" non-ICS, US -	UCA - 5" non-ICS, Canada	UDA - 5" non-ICS, Mexico	UAG - 7" ICS, US -	UCG - 7" ICS, Canada	UDG - 7" ICS, Mexico	UAM - 8.4" ICS, US -	UCM - 8.4" ICS, Canada	UDM - 8.4" ICS, Mexico	UAB - 5" non-ICS, NAV, US	UCB - 5" non-ICS, NAV, Canada	UDB - 5" non-ICS, NAV, Mexico	UAR - 8.4" Disassociated, US	UCR - 8.4" Disassociated, Canada	UDR - 8.4" Disassociated, Mexico	UAS - 8.4" ICS, Connected, US	UCS - 8.4" ICS, Connected, Canada	UAQ - 8.4" ICS, NAV, Connected, US	UCQ - 8.4" ICS, NAV, Connected, Canada	UDQ - 8.4" ICS, NAV, Mexico	UAV - 8.4" Disassociated, NAV, Connected, US	UCV - 8.4" Disassociated, NAV, Connected, Canada	UDV - 8.4" Disassociated, NAV, Mexico	UAX - 12.0" Disassociated, NAV, Connected, US	UCX - 12.0" Disassociated, NAV, Connected, Canada	UDX - 12.0" Disassociated, NAV, Mexico	UND - 7" non-ICS, US/Canada/Mexico, FB/BG	UNE - 7" non-ICS, NAV, US/Canada, FB/BG	UDE - 7" non-ICS, NAV, Mexico, BG
Continental										Panasonic										Continental								
Aptiv																												
VP2R															VP4R										VP2R			
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)																												

EMEA (Europe, Middle East, Africa)									
UGA - 5" non-ICS	UGB - 5" display	UGD - 7" display	UGG - 7" ICS	UGE - 7" display	UGM - 8.4" ICS	UGN - 8.4" ICS, NAV CONTINENTAL*	UGR - 8.4" display	UGQ - 8.4" ICS, NAV	UGV - 8.4" Disassociated, NAV
Continental						Panasonic			
Aptiv					-				
VP2R							VP4R		
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)									

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)									
UJA - 5" non-ICS	UJB - 5" non-ICS, NAV	UJD - 7" non-ICS	UJE - 7" non-ICS, NAV	UJG - 7" ICS	UJM - 8.4" ICS	UJQ - 8.4" ICS, NAV	UJV - 8.4" Disassociated, NAV	UJX - 12.0" Disassociated, NAV	
				Continental					
Aptiv	-			Aptiv		Panasonic			
		VP2R					VP4R		
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)									

China					
UKA - display	UKD - 7" display	UKG - 7" ICS	UKM - 8.4" ICS	UKQ - 8.4" ICS, NAV	UKV - 8.4" Disassociated, NAV
Continental				Panasonic	
Aptiv	-	Aptiv			
		VP2R	VP4R		
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)					

South Korea			
ULD - 7" ICS	ULG - 7" ICS	ULQ - 8.4" ICS, NAV	ULV - 8.4" Disassociated, NAV
	Continental		Panasonic
-	Aptiv		
	VP2R		VP4R
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)			

Japan			
UMD - 7" ICS	UMG - 7" ICS	UMQ - 8.4" ICS, NAV	UMV - 8.4" Disassociated, NAV
	Continental		Panasonic
-	Aptiv		
	VP2R		VP4R
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)			

CIP - RADIO - MATRIX

NA (United States, Canada, Mexico)											
UA1 +RSD	UA1 -RSD	RA1 +RSD	RA1 -RSD	RA2 +RSD	RA2 -RSD	RA3 +RSD+RS7	RA3 +RSD-RS7	RA3 -RSD-RS7	RA4 +RSD+RS7	RA4 +RSD-RS7	RA4 -RSD-RS7
EMEA (Europe, Middle East, Africa)											
RG2				RG3				RG4			
ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)											
UJ1			RJ1			RJ2			RJ4		
NEA (North East Asia)											
RK2 -China						RK4 -China					

CTP - RADIO - MATRIX

CTP							
REB - CTP Base AM/FM/CD/USB/AUX/SIRIUS	RHA - CTP Base AM/FM/MW/LW/CD/USB/AUX	RE2 - AM/FM/DVD/SD/USB/AUX/SIRIUS	RE3 - MW/LW/FM/DAB/DVD/SD/USB/AUX	RE6 - AM/FM/DVD/SD/USB/AUX	RB5 - AM/FM/DVD/SD/NAV/USB/AUX/SIRIUS	RB4 - MW/LW/FM/DAB/DVD/SD/NAV/USB/AUX	RB6 - AM/FM/DVD/SD/NAV/USB/AUX

NTG4 - RADIO - MATRIX

NTG4							
RHB - MW/FM/CD/DVD/HDD/MP3 Nav Radio	RBZ - AM/FM/CD/DVD/HDD/MP3 Radio	REQ - AM/FM 6 Disc DVD MP3 Radio	RES - AM/FM CD MP3 Radio				

GLOBAL RADIO MATRIX - 2021

REFRESH - RADIO - MATRIX

NA (North America)																															
UAA - 5" non-ICS, US -	UCA - 5" non-ICS, Canada	UDA - 5" non-ICS, Mexico	UAG - 7" ICS, US -	UCG - 7" ICS, Canada	UDG - 7" ICS, Mexico	UAM - 8.4" ICS, US -	UCM - 8.4" ICS, Canada	UDM - 8.4" ICS, Mexico	UAB - 5" non-ICS, NAV, US	UCB - 5" non-ICS, NAV, Canada	UDB - 5" non-ICS, NAV, Mexico	UAR - 8.4" Disassociated, US	UCR - 8.4" Disassociated, Canada	UDR - 8.4" Disassociated, Mexico	UAS - 8.4" ICS, Connected, US	UCS - 8.4" ICS, Connected, Canada	UAQ - 8.4" ICS, NAV, Connected, US	UCQ - 8.4" ICS, NAV, Connected, Canada	UDQ - 8.4" ICS, NAV, Mexico	UAV - 8.4" Disassociated, NAV, Connected, US	UCV - 8.4" Disassociated, NAV, Connected, Canada	UDV - 8.4" Disassociated, NAV, Mexico	UAX - 12.0" Disassociated, NAV, Connected, US	UCX - 12.0" Disassociated, NAV, Connected, Canada	UDX - 12.0" Disassociated, NAV, Mexico	UND - 7" non-ICS, US/Canada/Mexico, FB/BG	UNE - 7" non-ICS, NAV, US/Canada, FB/BG	UDE - 7" non-ICS, NAV, Mexico, BG			
Continental										Panasonic										Continental											
Aptiv																															
VP2R															VP4R												VP2R				
Continental (Atlantis / Small Architecture) Aptiv (CUSW / PowerNet Architecture)																															

EMEA (Europe, Middle East, Africa)									
UGA - 5" non-ICS	UGG - 7" ICS	UGM - 8.4" ICS	UGN - 8.4" ICS, NAV CONTINENTAL*	UGQ - 8.4" ICS, NAV	UGV - 8.4" Disassociated, NAV				

EMEA (Europe, Middle East, Africa)		
Continental		Panasonic
Aptiv		
VP2R		VP4R
• Continental (Atlantis / Small Architecture) • Aptiv (CUSW / PowerNet Architecture)		

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)								
UJA - 5" non-ICS	UJB - 5" non-ICS, NAV	UJD - 7" non-ICS	UJE - 7" non-ICS, NAV	UJG - 7" ICS	UJM - 8.4" ICS	UJQ - 8.4" ICS, NAV	UJV - 8.4" Disassociated, NAV	UJX - 12.0" Disassociated, NAV
Continental				Panasonic				
Aptiv	-							
VP2R				VP4R				
• Continental (Atlantis / Small Architecture) • Aptiv (CUSW / PowerNet Architecture)								

China			
UKG - 7" ICS	UKM - 8.4" ICS	UKQ - 8.4" ICS, NAV	UKV - 8.4" Disassociated, NAV
	Continental	Panasonic	
	Aptiv		
	VP2R	VP4R	
• Continental (Atlantis / Small Architecture) • Aptiv (CUSW / PowerNet Architecture)			

South Korea			
ULG - 7" ICS	ULQ - 8.4" ICS, NAV		ULV - 8.4" Disassociated, NAV
Continental			Panasonic
Aptiv			
VP2R			VP4R
- Continental (Atlantis / Small Architecture) - Aptiv (CUSW / PowerNet Architecture)			

Japan			
UMG - 7" ICS	UMQ - 8.4" ICS, NAV		UMV - 8.4" Disassociated, NAV
Continental			Panasonic
Aptiv			
VP2R			VP4R
- Continental (Atlantis / Small Architecture) - Aptiv (CUSW / PowerNet Architecture)			

R1 - RADIO - MATRIX

US										NA (United States, Canada, Mexico)												MEX										
										CAN																						
UBC - Uconnect 5 w 7" Display (Associated ICS)	UBD - Uconnect 5 w 8.4" Display (Associated)	UBE - Uconnect 5 w 8.4" Display (Associated Flush)	UBR - Uconnect 5 w 8.4" Display (Disassociated)	UBU - Uconnect 5 w 10.1" Display (Disassociated)	UBF - Uconnect 5 w 8.4" Display (Disassociated)	UBG - Uconnect 5 w 10.1" Display (Disassociated)	UBL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UBN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UBS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UBQ - Uconnect 5 NAV w 12.0" Display (Disassociated)	UEC - Uconnect 5 w 7" Display (Associated ICS)	UED - Uconnect 5 w 8.4" Display (Associated)	UEE - Uconnect 5 w 8.4" Display (Associated Flush)	UER - Uconnect 5 w 8.4" Display (Disassociated)	UEU - Uconnect 5 w 10.1" Display (Disassociated)	UEF - Uconnect 5 w 8.4" Display (Disassociated)	UEG - Uconnect 5 w 10.1" Display (Disassociated)	UEL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UEN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UES - Uconnect 5 NAV w 10.25" Display (Disassociated)	UEQ - Uconnect 5 NAV w 12.0" Display (Disassociated)	UFC - Uconnect 5 w 7" Display (Associated ICS)	UFD - Uconnect 5 w 8.4" Display (Associated)	UFE - Uconnect 5 w 8.4" Display (Associated Flush)	UFR - Uconnect 5 w 8.4" Display (Disassociated)	UFU - Uconnect 5 w 10.1" Display (Disassociated)	UFF - Uconnect 5 w 8.4" Display (Disassociated)	UFG - Uconnect 5 w 10.1" Display (Disassociated)	UFL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UFN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UFS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UFQ - Uconnect 5 NAV w 12.0" Display (Disassociated)

EMEA (Europe, Middle East, Africa)									
UHC - Uconnect 5 w 7" Display (Associated ICS)	UHD - Uconnect 5 w 8.4" Display (Associated)	UHE - Uconnect 5 w 8.4" Display (Associated Flush)	UHU - Uconnect 5 w 10.1" Display (Disassociated)	UHF - Uconnect 5 w 8.4" Display (Disassociated)	UHG - Uconnect 5 w 10.1" Display (Disassociated)	UHL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UHN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UHS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UHQ - Uconnect 5 NAV w 12.0" Display (Disassociated)

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)												
Without DAB (Digital Audio Broadcasting)												
UPA - Uconnect 5 w 7" Display (Associated non-ICS)	UPB - Uconnect 5 w 7" Display (Disassociated non-ICS)	UPC - Uconnect 5 w 7" Display (Associated ICS)	UPD - Uconnect 5 w 8.4" Display (Associated)	UPE - Uconnect 5 w 8.4" Display (Associated Flush)	UPU - Uconnect 5 w 10.1" Display (Disassociated)	UPF - Uconnect 5 w 8.4" Display (Disassociated)	UPG - Uconnect 5 w 10.1" Display (Disassociated)	UPL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UPN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UPS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UPQ - Uconnect 5 NAV w 12.0" Display (Disassociated)	
With DAB (Digital Audio Broadcasting)												
UUC - Uconnect 5 w 7" Display (Associated ICS)	UUY - Uconnect 5 w 7" Display (Associated Flush)	UUD - Uconnect 5 w 8.4" Display (Associated)	UUE - Uconnect 5 w 8.4" Display (Associated Flush)	UUU - Uconnect 5 w 10.1" Display (Disassociated)	UUF - Uconnect 5 w 8.4" Display (Disassociated)	UUG - Uconnect 5 w 10.1" Display (Disassociated)	UUL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UUN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UUS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UUQ - Uconnect 5 NAV w 12.0" Display (Disassociated)		

China									
UQD - Uconnect 5 w 8.4" Display (Associated)	UQE - Uconnect 5 w 8.4" Display (Associated Flush)	UQU - Uconnect 5 w 10.1" Display (Disassociated)	UQG - Uconnect 5 w 10.1" Display (Disassociated)	UQL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UQN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UQS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UQQ - Uconnect 5 NAV w 12.0" Display (Disassociated)		

South Korea									
URD - Uconnect 5 w 8.4" Display (Associated)	URE - Uconnect 5 w 8.4" Display (Associated Flush)	URL - Uconnect 5 NAV w 8.4" Display (Disassociated)	URN - Uconnect 5 NAV w 10.1" Display (Disassociated)	URS - Uconnect 5 NAV w 10.25" Display (Disassociated)	URQ - Uconnect 5 NAV w 12.0" Display (Disassociated)				

Japan									
UTD - Uconnect 5 w 8.4" Display (Associated)	UTE - Uconnect 5 w 8.4" Display (Associated Flush)	UTL - Uconnect 5 NAV w 8.4" Display (Disassociated)	UTN - Uconnect 5 NAV w 10.1" Display (Disassociated)	UTS - Uconnect 5 NAV w 10.25" Display (Disassociated)	UTQ - Uconnect 5 NAV w 12.0" Display (Disassociated)				

CIP - RADIO - MATRIX

NA (United States, Canada, Mexico)									
UA1 +RSD	UA1 -RSD	RA1 +RSD	RA1 -RSD	RA2 +RSD	RA2 -RSD	RA3 +RSD-RS7	RA3 +RSD-RS7	RA4 +RSD+RS7	RA4 +RSD-RS7

EMEA (Europe, Middle East, Africa)									
RG2	RG3	RG4							

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)									
UJ1	RJ1	RJ2							

NEA (North East Asia)									
RK2 -China	RK4 -China								

CTP - RADIO - MATRIX

CTP									
REB - CTP Base AM/FM/CD/USB/AUX/SIRIUS	RHA - CTP Base AM/FM/MW/LW/CD/USB/AUX	RE2 - AM/FM/DVD/SD/USB/AUX/SIRIUS	RE3 - MW/LW/FM/DAB/DVD/SD/USB/AUX	RE6 - AM/FM/DVD/SD/USB/AUX	RB5 - AM/FM/DVD/SD/NAV/USB/AUX/SIRIUS	RB4 - MW/LW/FM/DAB/DVD/SD/NAV/USB/AUX	RB6 - AM/FM/DVD/SD/NAV/USB/AUX		

NTG4 - RADIO - MATRIX

NTG4									
RHB - MW/FM/CD/DVD/HDD/MP3 Nav Radio	RBZ - AM/FM/CD/DVD/HDD/MP3 Radio	REQ - AM/FM 6 Disc DVD MP3 Radio	RES - AM/FM CD MP3 Radio						

GLOBAL RADIO MATRIX - 2022

REFRESH - RADIO - MATRIX

NA (North America)																												
5"		7"	8.4"		8.4"		12.0"	5"		7"	8.4"		8.4"			12.0"	5"		7"		8.4"		8.4"		12.0"	Fiat 500X (FD) & Fiat 500L (BG)		
UAA	UAB	UAG	UAM	UAR	UAS	UAQ	UAV	UAX	UCA	UCB	UCG	UCM	UCR	UCS	UCQ	UCV	UCX	UDA	UDB	UDG	UDE	UDM	UDR	UDQ	UDV	UDX	UND (7")	UNE (7")

NA (North America)																						
UconnectB® 3 with 5" display non-ics	UconnectB® 3 NAV with 5" display non-ics	UconnectB® 4 with 7" display	UconnectB® 4 with 8.4" display	UconnectB® 4C with 8.4" display	UconnectB® 4C NAV with 8.4" display	UconnectB® 4C NAV with 12" display	UconnectB® 3 with 5" display non-ics	UconnectB® 3 NAV with 5" display non-ics	UconnectB® 4 with 7" display	UconnectB® 4 with 8.4" display	UconnectB® 4C with 8.4" display	UconnectB® 4C NAV with 8.4" display	UconnectB® 4C NAV with 12" display	UconnectB® 3 with 5" display non-ics	UconnectB® 3 NAV with 5" display non-ics	UconnectB® 4 with 7" display	UconnectB® 4 NAV with 7" display	UconnectB® 4 with 8.4" display	UconnectB® 4 NAV with 8.4" display	UconnectB® 4 NAV with 12" display	UconnectB® 4 with 7" display non-ics	UconnectB® 4 NAV with 7" display non-ics
VP2R				VP4R			VP2R				VP4R			VP2R						VP4R		VP2R
Conti				-			Conti		-			Conti						-		-		Conti
Aptiv	-	Aptiv		Panasonic			Aptiv	-	Aptiv		Panasonic			Aptiv	-	Aptiv	-	Aptiv	Panasonic		-	

EMEA (Europe, Middle East, Africa)																						
5"				7"			8.4"				8.4"			8.4"						8.4"		
UGA				UGG			UGM				UGN			UGQ						UGV		
UconnectB® 3 with 5" display non-ics				UconnectB® 4 with 7" display			UconnectB® 4 with 8.4" display				UconnectB® 4 8.4" NAV DAB radio - Con NAV			UconnectB® 4 NAV with 8.4" display								
VP2R														VP4R								
Conti														-								
Aptiv							-							-								
-														Panasonic								

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)																						
5"				7"			8.4"				8.4"			8.4"						12.0"		
UJA				UJB			UJD				UJE			UJM						UJV		UJX
UconnectB® 3 with 5" display non-ics				UconnectB® 3 NAV with 5" display non-ics			UconnectB® 4 with 7" display non-ics				UconnectB® 4 NAV with 7" display non-ics			UconnectB® 4 with 8.4" display						UconnectB® 4 NAV with 8.4" display		UconnectB® 4 NAV with 12" display
VP2R														VP4R								
Conti														-								
Aptiv				-			Aptiv				-			Aptiv								
-														Panasonic								

China																						
7"							8.4"															
UKG							UKM				UKQ			UKV								
UconnectB® 4 with 7" display							UconnectB® 4 with 8.4" display							UconnectB® 4 NAV with 8.4" display								
				VP2R										VP4R								
				Conti										-								
				Aptiv										-								
-				-										Panasonic								

South Korea																						
7"							8.4"															
ULG							ULQ							ULV								
UconnectB® 4 with 7" display							UconnectB® 4 NAV with 8.4" display															
VP2R							VP4R															
Conti																						
Aptiv																						
-							Panasonic															

Japan																						
7"							8.4"															
UMG							UMQ							UMV								
UconnectB® 4 with 7" display							UconnectB® 4 NAV with 8.4" display															
VP2R							VP4R															
Conti																						
Aptiv																						
-							Panasonic															

R1 - RADIO - MATRIX

NA (United States, Canada, Mexico)																																						
R1 LOW					R1 High Decontented / MID			R1 HIGH					R1 LOW					R1 High Decontented / MID			R1 HIGH					R1 LOW					R1 High Decontented / MID			R1 HIGH				
7"	8.4"		10.1"	10.25"	8.4"	10.1"	8.4"	10.1"	10.25"	12.0"	12.3"	7"	8.4"		10.1"	10.25"	8.4"	10.1"	8.4"	10.1"	10.25"	12.0"	12.3"	7"	8.4"		10.1"	10.25"	8.4"	10.1"	8.4"	10.1"	10.25"	12.0"	12.3"			
UBC	UBD	UBE Flush- Mount	UBR	UBU	UBH	UBF	UBG	UBL	UBN	UBS	UBQ	UBX	UEC	UED	UEE Flush- Mount	UER	UEU	UEH	UEF	UEG	UEL	UEN	UES	UEQ	UEX	UFC	UFD	UFE Flush- Mount	UFR	UFU	UFH	UFF	UFG	UFL	UFN	UFS	UFQ	UFX
UconnectB® 5 with 7" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12.3" display	UconnectB® 5 with 7" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12.3" display	UconnectB® 5 NAV with 7" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.25" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12.3" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12.3" display	
R1L					R1HighD			R1H					R1L					R1HighD			R1H					R1L					R1HighD			R1H				
Melco					-			Melco					-					Melco			-					Melco					-			Harman				
-					Harman			-					-					Harman			-					-					Harman			-				

8.4"				10.1"				China		10.1"				10.25"				12.0"				12.3"									
UQD		UQE Flush-Mount		UQU		UQG		UQL		UQN		UQS		UQQ		UQX															
UconnectB® 5 with 8.4" display				UconnectB® 5 with 10.1" display				UconnectB® 5 with 10.1" display				UconnectB® 5 NAV with 8.4" display				UconnectB® 5 NAV with 10.1" display				UconnectB® 5 NAV with 10.25" display				UconnectB® 5 NAV with 12" display				UconnectB® 5 NAV with 12.3" display			
R1L								R1HighD				R1H																			
Melco								-																							
-								Harman																							
South Korea																															
R1 LOW 8.4"				R1 HIGH 8.4"				10.1"				10.25"				12.0"				12.3"											
URD		URE Flush-Mount		URL		URN		URS		URQ		URX																			
UconnectB® 5 with 8.4" display				UconnectB® 5 NAV with 8.4" display				UconnectB® 5 NAV with 10.1" display				UconnectB® 5 NAV with 10.25" display				UconnectB® 5 NAV with 12" display				UconnectB® 5 NAV with 12.3" display											
R1L				R1H																											
Melco				-																											
-				Harman																											
Japan																															
R1 LOW 8.4"				8.4"				10.1"				10.25"				12.0"				12.3"											
UTD		UTE Flush-Mount		UTL		UTN		UTS		UTQ		UTX																			
UconnectB® 5 with 8.4" display				UconnectB® 5 NAV with 8.4" display				UconnectB® 5 NAV with 10.1" display				UconnectB® 5 NAV with 10.25" display				UconnectB® 5 NAV with 12" display				UconnectB® 5 NAV with 12.3" display											
R1L								R1H																							
Melco								-																							
-								Harman																							
CIP - RADIO - MATRIX																															
NA (United States, Canada, Mexico)																															
UA1 +RSD		UA1 -RSD		RA1 +RSD		RA1 -RSD		RA2 +RSD		RA2 -RSD		RA3 +RSD+RS7		RA3 +RSD-RS7		RA3 -RSD-RS7		RA4 +RSD+RS7		RA4 -RSD-RS7											
EMEA (Europe, Middle East, Africa)																															
RG2								RG3								RG4															
ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)																															
UJ1								RJ1								RJ2															
NEA (North East Asia)																															
RK2 -China								RK4 -China																							
CTP - RADIO - MATRIX																															
CTP																															
REB - CTP Base AM/FM/CD/USB/AUX/SIRIUS				RHA - CTP Base AM/FM/MW/LW/CD/USB/AUX				RE2 - AM/FM/DVD/SD/USB/AUX/SIRIUS				RE3 - MW/LW/FM/DAB/DVD/SD/USB/AUX				RE6 - AM/FM/DVD/SD/USB/AUX				RB5 - AM/FM/DVD/SD/NAV/USB/AUX/SIRIUS				RB4 - MW/LW/FM/DAB/DVD/SD/NAV/USB/AUX				RB6 - AM/FM/DVD/SD/NAV/USB/AUX			
NTG4 - RADIO - MATRIX																															
NTG4																															
RHB - MW/FM/CD/DVD/HDD/MP3 Nav Radio								RBZ - AM/FM/CD/DVD/HDD/MP3 Radio								REQ - AM/FM 6 Disc DVD MP3 Radio								RES - AM/FM CD MP3 Radio							
GLOBAL RADIO MATRIX - 2023																															
REFRESH - RADIO - MATRIX																															
NA (North America)																															
5"		7"		8.4"		8.4"			12.0"		5"			7"			8.4"		12.0"		5"		7"		8.4"		12.0"		Fiat 500X (FD) & Fiat 500L (BG)		
UAA	UAB	UAG	UAM	UAR	UAS	UAQ	UAV	UAX	UCA	UCB	UCG	UCM	UCR	UCS	UCQ	UCV	UCX	UDA	UDB	UDG	UDE	UDM	UDR	UDQ	UDV	UDX	UND (7")	UNE (7")			
UconnectB® 3 with 5" display	UconnectB® 3 NAV with 5" display	UconnectB® 4 with 7" display	UconnectB® 4 with 8.4" display	UconnectB® 4C with 8.4" display	UconnectB® 4C NAV with 8.4" display	UconnectB® 4C NAV with 12" display	UconnectB® 3 with 5" display	UconnectB® 3 NAV with 5" display	UconnectB® 4 with 7" display	UconnectB® 4 with 8.4" display	UconnectB® 4C with 8.4" display	UconnectB® 4C NAV with 8.4" display	UconnectB® 4C NAV with 12" display	UconnectB® 3 with 5" display	UconnectB® 3 NAV with 5" display	UconnectB® 4 with 7" display	UconnectB® 4 NAV with 8.4" display	UconnectB® 4 with 7" display	UconnectB® 4 NAV with 7" display	UconnectB® 4 with 8.4" display	UconnectB® 4 NAV with 8.4" display	UconnectB® 4 NAV with 12" display	UconnectB® 4 NAV with 12" display	UconnectB® 4 NAV with 7" display	UconnectB® 4 NAV with 7" display	UconnectB® 4 NAV with 7" display					
VP2R				VP4R				VP2R				VP4R				VP2R				VP4R				VP2R							
Conti				-				Conti		-				-				Conti				-				Conti					
Aptiv	-	Aptiv	Panasonic				Aptiv	-	Aptiv	Panasonic				Aptiv	-	Aptiv	-	Aptiv	Panasonic				-								
ECE (includes Europe, Russia, Turkey)																															
5"				7"				8.4"				8.4"				8.4"				8.4"											
UGA				UGG				UGM				UGN				UGQ				UGV											
UconnectB® 3 with 5" display				UconnectB® 4 with 7" display				UconnectB® 4 with 8.4" display				UconnectB® 4 8.4" NAV DAB radio - Con NAV				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display											
				VP2R												VP4R															
				Conti												-															
				Aptiv												-				Panasonic											
				-																											
ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia)																															
5"				7"				8.4"				8.4"				8.4"				12.0"											
UJA		UJB		UJD		UJG		UJE		UJM		UJQ		UJV		UJX															
UconnectB® 3 with 5" display		UconnectB® 3 NAV with 5" display		UconnectB® 4 with 7" display		UconnectB® 4 NAV with 7" display		UconnectB® 4 NAV with 8.4" display		UconnectB® 4 NAV with 8.4" display		UconnectB® 4 NAV with 8.4" display		UconnectB® 4 NAV with 12" display																	
				VP2R												VP4R															
				Conti												-															
Aptiv				-		Aptiv		-		Aptiv				-																	
												Panasonic																			
China																															
7"				8.4"				8.4"				8.4"				8.4"															
UKG				UKM				UKQ				UKV																			
UconnectB® 4 with 7" display				UconnectB® 4 with 8.4" display				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display															
				VP2R								VP4R																			
				Conti								-																			
				Aptiv								-																			
				-								Panasonic																			
South Korea																															
7"				8.4"				8.4"				8.4"																			
ULG				ULQ				ULV																							
UconnectB® 4 with 7" display				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display																			
				VP2R								VP4R																			
				Conti								-																			
				Aptiv								-																			
				-								Panasonic																			
Japan																															
7"				8.4"				8.4"				8.4"																			
UMG				UMQ				UMV																							
UconnectB® 4 with 7" display				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display				UconnectB® 4 NAV with 8.4" display																			

Japan															
VP2R								VP4R							
Conti								-							
Aptiv								-							
-								Panasonic							

R1 - RADIO - MATRIX

NA (United States, Canada, Mexico)																																										
R1 LOW					R1 High Decontented / MID		R1 HIGH					R1 LOW					R1 High Decontented / MID		R1 HIGH					R1 LOW					R1 HIGH													
7"	8.4"	10.1"	10.25"	12.3"	8.4"	10.1"	8.4"	10.1"	10.25"	12.0"	12.3"	7"	8.4"	10.1"	10.25"	12.3"	8.4"	10.1"	8.4"	10.1"	10.25"	12.0"	12.3"	7"	8.4"	10.1"	10.25"	12.3"	8.4"	10.1"	10.25"	12.0"	12.3"									
UBC	UBD	UBE	UBR	UBU	UBH	UBK	UBF	UBG	UBL	UBN	UBS	UBQ	UBX	UEC	UED	UEE	UER	UEU	UEH	UEK	UEF	UEB	UEL	UEN	UES	UEQ	UEX	UFC	UFD	UFE	UFR	UFU	UFH	UFK	UFL	UFN	UFS	UFQ	UFX			
UconnectB® 5 with 7" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 12.3" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.25" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 with 7" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 12.3" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 12.3" display	UconnectB® 5 NAV with 12.3" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 12.3" display	UconnectB® 5 NAV with 7" display	UconnectB® 5 with 8.4" display	UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 12.3" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.25" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12.3" display					
R1L					R1HighD		R1H					R1L					R1HighD		R1H					R1L			R1H			R1L			R1H			R1L			R1H			
Melco							-					Melco							-					Melco						-								-				
-							Harman					-							Harman					-						-								Harman				

ECE (includes Europe, Russia, Turkey)											
R1 LOW						R1 HIGH					
7"	8.4"		10.1"	10.25"	12.3"	8.4"	10.1"	10.25"	12.0"	12.3"	
UHC	UHD	UHE	UHU	UHH	UHK	UHL	UHN	UHS	UHQ	UHX	
UconnectB® 5 with 7" display	UconnectB® 5 with 8.4" display		UconnectB® 5 with 10.1" display	UconnectB® 5 with 10.25" display	UconnectB® 5 with 12.3" display	UconnectB® 5 NAV with 8.4" display	UconnectB® 5 NAV with 10.1" display	UconnectB® 5 NAV with 10.25" display	UconnectB® 5 NAV with 12" display	UconnectB® 5 NAV with 12.3" display	
R1L						R1H					
Melco						-					
-						Harman					

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia) without DAB+ (Digital Audio Broadcasting)																					
R1 LOW							R1 HIGH														
7"		8.4"		10.1"		10.25"		12.3"		8.4"		10.1"		10.25"		12"		12.3"			
UPA	UPB	UPC	UPD	UPE	UPU	UPH	UPK	UPL	UPN	UPS	UPQ	UPX									
UconnectB® 5 with 7" display			UconnectB® 5 with 8.4" display			UconnectB® 5 with 10.1" display		UconnectB® 5 with 10.25" display		UconnectB® 5 with 12.3" display		UconnectB® 5 NAV with 8.4" display		UconnectB® 5 NAV with 10.1" display		UconnectB® 5 NAV with 10.25" display		UconnectB® 5 NAV with 12" display		UconnectB® 5 NAV with 12.3" display	
R1L							R1H														
Melco							-														
-							Harman														

ROW (Rest of World - LATAM, Middle East, Africa, Australia, New Zealand, South East Asia) with DAB+ (Digital Audio Broadcasting)																							
R1 LOW						R1 HIGH																	
7"		8.4"		10.1"		10.25"		12.3"		8.4"		10.1"		10.25"		12.0"		12.3"					
UUC		UUY		UUD		UUE		UUU		UUH		UUK		UUL		UUN		UUS		UUQ		UUX	
UconnectB® 5 with 7" display		UconnectB® 5 with 7" display		UconnectB® 5 with 8.4" display		UconnectB® 5 with 10.1" display		UconnectB® 5 with 10.25" display		UconnectB® 5 with 12.3" display		UconnectB® 5 NAV with 8.4" display		UconnectB® 5 NAV with 10.1" display		UconnectB® 5 NAV with 10.25" display		UconnectB® 5 NAV with 12" display		UconnectB® 5 NAV with 12.3" display			
R1L						R1H																	
Melco						-						-											
-												Harman											

					China														
R1 LOW					R1 HIGH														
8.4"		10.1"		10.25"		12.3"		8.4"		10.1"		10.25"		12.0"		12.3"			
UQD		UQE		UQU		UQH		UQK		UQL		UQN		UQS		UQQ		UQX	
UconnectB® 5 with 8.4" display				UconnectB® 5 with 10.1" display		UconnectB® 5 with 10.25" display		UconnectB® 5 with 12.3" display		UconnectB® 5 NAV with 8.4" display		UconnectB® 5 NAV with 10.1" display		UconnectB® 5 NAV with 10.25" display		UconnectB® 5 NAV with 12" display		UconnectB® 5 NAV with 12.3" display	
R1L					R1H														
Melco					-					-					-				
															Harman				

Software Update Error Code	Software Update Error String	Explanation	Guidelines
			1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Once head unit comes back into application mode and fully functional, remove the USB. 3.Format the USB in PC. 4.Copy a software update package in USB other than what is currently running in Head Unit. 5.Perform software update again.
3	Invalid Software Update Error	Observed when unexpected error is observed.	Don'ts : 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Once head unit comes back into application mode and fully functional, remove the USB. 3.Format the USB in PC. 4.Copy VP4R_ Update and map package folders into USB root. 5.Perform software update again.
4	Corrupted Package Error	Observed when one or more files are corrupted in VP4R_ Update folder in USB.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Once head unit comes back into application mode and fully functional, remove the USB. 3.Format the USB in PC. 4.Copy VP4R_ Update and map package folders into USB root. 5.Perform software update again.
5	Invalid Signature Error	Observed when the security of USB package files is compromised.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Once head unit comes back into application mode and fully functional, remove the USB. 3.Format the USB in PC. 4.Copy VP4R_ Update and map package folders into USB root. 5.Perform software update again. 6.If still same error is observed, replace Radio.
6	Start to Application Mode - Error	Observed when head unit failed to come back into application mode after software update.	Do's: 1.Remove USB from Head unit. 2.Wait for 2 minutes. 3.If Head unit is still stuck into this error, do a power OFF (Ignition OFF). 4.Insert the USB again. 5.Do a Power ON (Ignition ON). 6.Wait for head unit to come back into application mode. 7.Still facing same issue, replace Radio.
7	Flashing: Meta Info information Error	Observed when there is an error in flashing Meta info segment.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
8	Flashing: BootManager LBA information Error	Observed when there is an error in flashing BootManager LBA segment.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
9	Flashing: LBA information Error	Observed when there is an error in writing into LBA information.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
10	Flashing: J6 Application information Error	Observed when there is an error in flashing J6 Application segment.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
11	Flashing: J6 Flash Loader information Error	Observed when there is an error in flashing J6 Flashloader segment.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
12	Flashing: Boot Loader information Error	Observed when there is an error in flashing Bootloader.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
13	Flashing: NOR OS information Error	Observed when there is an error in flashing J6 NOR OS segment.	Don'ts: 1.Don't remove the USB. Do's : 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
14	Flashing: NOR Animation information Error	Observed when there is an error in flashing NOR Animation segment.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
15	Flashing: Boot Micro information Error	Observed when there is an error in flashing Boot Micro.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.)

Software Update Error Code	Software Update Error String	Explanation	Guidelines
			2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
16	Flashing: Boot Micro User Boot information Error	Observed when there is an error in flashing Boot Micro User Boot.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
17	Flashing: VR information Error	Observed when there is an error in flashing VR information.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
18	Flashing: HMI Skin information Error	Observed when there is an error in flashing HMI Skin information.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
19	Flashing: Receiver information Error	Observed when there is an error in flashing Receiver information.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
20	Flashing: Cell Modem information Error	Observed when there is an error in flashing Cell Modem information.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
21	Flashing: Audio DSP information Error	Observed when there is an error in flashing Audio DSP information.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
22	Flashing: Internal Communication Error	Observed when there is an error in IPC channel between J6 and Boot micro.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
23	Flashing: Navigation Map information Error	Observed when there is an error Flashing Navigation Maps.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.
24	Update Delta information Error	Observed when CRC error of J6 partitions failed to match with CRC in delta package.	Don'ts: 1.Don't insert the USB having software update packages during FOTA update. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.On next Ignition on, Head unit will download the delta package again. 3.On ignition off, try to do delta update again. 4.If still facing same error code, contact PASA team.
25	Backup Collection Error	Observed when backup collection failed.	Don'ts: 1.Don't remove the USB. Do's: 1.Allow Head unit to rollback into application mode. (This may take approximately 10 minutes, you will be asked would you like to perform update when completed.) 2.Initiate the software update again. 3.Try 2 iterations of software update, if still facing error, replace Radio.

DIAGNOSIS AND TESTING - AUDIO

Any diagnosis of the Audio system should begin with duplicating the customer concern (verify the problem), include checking for applicable Technical Service Bulletins (TSB), Star Online Publications, software updates and the use of a diagnostic scan tool. Check for any Diagnostic Trouble Code (DTC) data. If a DTC is found, refer to - Radio and perform the appropriate diagnostic procedure before proceeding in this information. Refer to the appropriate wiring information.

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

AUDIO SYSTEM DIAGNOSTIC TABLE			
CONDITION	POSSIBLE CAUSES	CORRECTION	
RADIO INOPERATIVE	1. Fuse inoperative. 2. Open wiring. 3. Security Gateway Module (SGW) inoperative.	Check radio fuse. Check "No Response from ECU". Refer to NO RESPONSE FROM ECU . Check "Scan Tool Will Not Communicate With Vehicle". Refer to SCAN TOOL WILL NOT COMMUNICATE WITH VEHICLE .	
NO AUDIO - BUT RADIO LIGHTS UP	1. Antenna problem. 2. Radio or Amplifier (if equipped) connector damaged. 3. Wiring damaged. 4. Radio or Amplifier (if equipped) ground damaged. 5. Amplifier (if equipped) inoperative. 6. Speakers inoperative.	Perform the "Poor or No AM/FM Audio Reception" test. Refer to POOR OR NO AM/FM AUDIO RECEPTION . Check for loose or corroded radio/amplifier connector. Repair, as required. Check for shorted or open wires. Repair wiring as required. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground as required. Refer to AMPLIFIER (AMP) - DIAGNOSTIC CODE INDEX . Refer to AUDIO (RADIO) - DIAGNOSTIC CODE INDEX .	
NO RADIO DISPLAY	1. Fuse inoperative. 2. Radio connector damaged. 3. Wiring damaged. 4. Radio ground circuit damaged. 5. Radio inoperative. 6. Center stack screen	Check radio fuse. Replace fuses as required. Check for loose or corroded radio connector. Repair as required. Check for battery voltage at radio connector. Repair wiring as required. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground as required. Check "No Response from Radio". Refer to the appropriate information. Refer to the appropriate information.	
POOR AM/FM RADIO RECEPTION	1. Antenna inoperative. 2. Radio ground damaged. 3. Radio inoperative.	Perform the "Poor or No AM/FM Audio Reception" test. Refer to POOR OR NO AM/FM AUDIO RECEPTION . Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground as required. Refer to AUDIO (RADIO) - DIAGNOSTIC CODE INDEX or Refer to DIAGNOSIS AND TESTING .	
POOR SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) AUDIO RECEPTION	1. SDARS antenna Inoperative.	Perform the "Poor or No Satellite Audio Reception" test. Refer to POOR OR NO AM/FM AUDIO RECEPTION .	
SOUND DISTORTION (VIBRATION FROM SPEAKER AREA, BUZZING - HUMMING)	1. Door trim panel loose or missing fasteners. 2. Water shield loose or misaligned. 3. Items placed in door trim panel map pockets vibrating or moving from side to side.	Inspect door trim panel and correct as necessary. Replace any missing fasteners. Inspect water shield and adjust as required. Remove items from door trim panel. Make sure that the vibration is no longer present.	

POOR OR NO AM/FM AUDIO RECEPTION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

POSSIBLE CAUSES

Possible Causes
ANTENNA CONNECTION ANTENNA CABLE ANTENNA RADIO

DIAGNOSTIC TEST

1. ANTENNA INSPECTION

- Using Service Information locate and verify the antenna is on the vehicle.
- Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Antenna in accordance with the Service Information. Refer to [BODY AND CABLE, ANTENNA, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To the appropriate information

2. CHECK THE ANTENNA CONNECTIONS

- Turn the ignition off.
- Disconnect the Radio Antenna connector at the Antenna.
- Disconnect the Radio Antenna connector at the rear of the Radio.
- Inspect both of the Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To the appropriate information

No

- Clean the antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. RADIO

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

- Connect the (special tool #9977-6-FM, Antenna) to the Radio C3 component connector.
- Place the test antenna base on the roof of the vehicle.
- Turn the ignition on.
- Drive the vehicle outside to an un-obstructed area.
- Turn the Radio on and select several different known good stations from the AM and FM bands.
- Note any of the following type of reception concerns being heard:

- Silence
- Static
- Noise
- Popping
- Screeching
- Hissing
- Crackling
- Humming
- Weak Signal
- Interference
- Motor Sound

Is the audio reception still poor or not available?

Yes

- Replace the Radio in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ANTENNA

NOTE: **Antenna reception testing**

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

- Turn the ignition off.
- Reconnect the Radio C3 harness connector.
- Disconnect the Radio Antenna harness connector.
- Connect the (special tool #9977-6-FM, Antenna) to the Radio Antenna harness connector.
- Turn the Radio on and select several different known good stations from the AM and FM bands.
- Note any of the following type of reception concerns being heard:

- Silence
- Static
- Noise
- Popping
- Screeching
- Hissing
- Crackling
- Humming
- Weak Signal
- Interference
- Motor Sound

Is the audio reception still poor or not available?

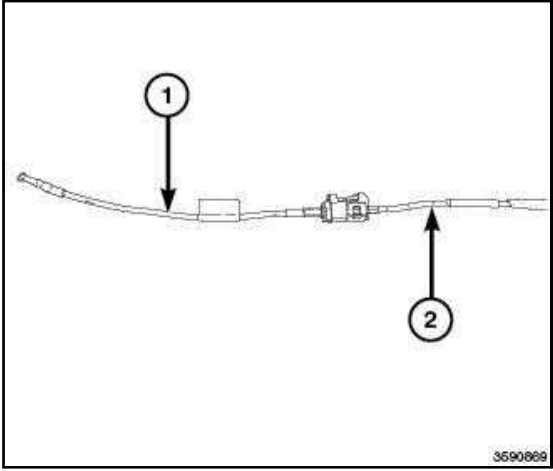
Yes

- Go To [5](#)

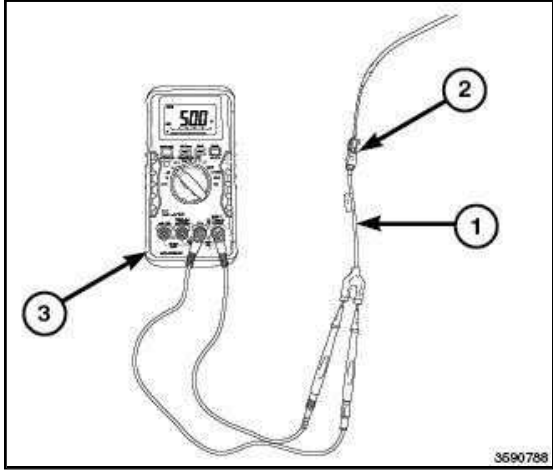
No

- Replace the Radio Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. ANTENNA CABLE



1. Turn the ignition off.
2. Disconnect the (special tool #9977-6-FM, Antenna) from the Radio Antenna harness connector.
3. Connect the appropriate (special tool #9977-6-4, Jumper) (1) or (special tool #9977-6-2, Jumper) (1) to the Radio Antenna harness connector (2) at the Antenna.



4. Disconnect the Radio C3 harness connector.
5. Connect the appropriate (special tool #9977-6-1, Adapter) (1) or (special tool #9977-6-3, Adapter) (1) to the Radio C3 harness connector (2).
6. Measure the resistance across the tool terminals.

Is the resistance between 47.5 and 52.5 Ohms?

Yes

- The source of the poor reception is not caused by the Radio, Antenna Cable or Radio Antenna.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Antenna Cable in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

POOR OR NO SATELLITE AUDIO RECEPTION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

POSSIBLE CAUSES

Possible Causes
SATELLITE ANTENNA CONNECTION SATELLITE ANTENNA CABLE SATELLITE ANTENNA RADIO

DIAGNOSTIC TEST

1. ANTENNA INSPECTION

1. Using Service Information locate and verify the antenna is on the vehicle.
2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Satellite Antenna in accordance with the Service Information. Refer to [ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [2](#)

2. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Satellite Radio Antenna connector at the Antenna.
3. Disconnect the Satellite Radio Antenna connector at the rear of the Radio.
4. Inspect both of the Satellite Radio Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [3](#)

No

- Clean the Satellite Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. RADIO

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) to the Satellite Antenna connection on the back of the Radio.

- Place the test antenna base on the roof of the vehicle.
- Turn the ignition on.
- Drive the vehicle outside to an un-obstructed area.
- Turn the Satellite Radio on and select several different known good stations.

Is the reception still poor or not available?

Yes

- Replace the Radio in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ANTENNA

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

- Turn the ignition off.
- Reconnect the Radio C6 harness connector.
- Disconnect the Satellite Audio Antenna harness connector.
- Connect the (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) (1) to the Satellite Audio Antenna harness connector (2).
- Turn the Satellite Radio on and select several different known good stations.

Is the reception still poor or not available?

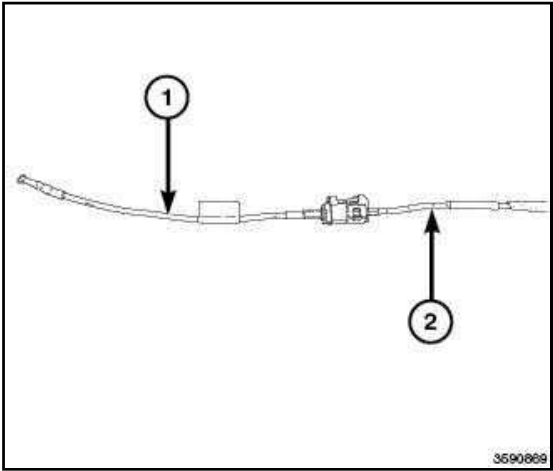
Yes

- Go To [5](#)

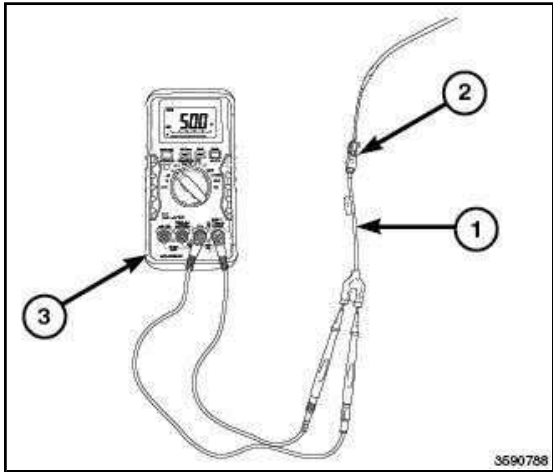
No

- Replace the Satellite Audio Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. ANTENNA CABLE



- Turn the ignition off.
- Disconnect the (special tool #9977-6-SATXM, Antenna, Satellite/Sirius XM) from the Satellite Audio Antenna harness connector.
- Connect the appropriate (special tool #9977-6-4, Jumper) (1) or (special tool #9977-6-2, Jumper) (1) to the Satellite Audio Antenna harness connector (2) at the Antenna.



- Connect the appropriate (special tool #9977-6-1, Adapter) (1) or (special tool #9977-6-3, Adapter) (1) to the Radio C6 harness connector (2).
- Measure the resistance across the tool terminals.

Is the resistance between 47.5 and 52.5 Ohms?

Yes

- The source of the poor reception is not caused by the Radio, Satellite Antenna Cable or Satellite Antenna.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Satellite Audio Antenna Cable in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

POOR OR NO CELLULAR RECEPTION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

POSSIBLE CAUSES

Possible Causes
CELLULAR ANTENNA CONNECTION CELLULAR ANTENNA CABLE CELLULAR ANTENNA RADIO

DIAGNOSTIC TEST

1. ANTENNA INSPECTION

- Using Service Information locate and verify the antenna is on the vehicle.
- Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [2](#)

2. CHECK THE ANTENNA CONNECTIONS

1. Turn the ignition off.
2. Disconnect the Cellular Antenna connector at the Antenna.
3. Disconnect the Cellular Antenna connector at the rear of the Radio.
4. Inspect both of the Cellular Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [3](#)

No

- Clean the Cellular Antenna connection(s) / torque to specification as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. RADIO

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) to the Cellular Antenna connection on the back of the Radio.
2. Place the test antenna base on the roof of the vehicle.
3. Turn the ignition on.
4. Drive the vehicle outside to an un-obstructed area.
5. Turn the Radio on.

Is the reception still poor or not available?

Yes

- Replace the Radio in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. ANTENNA

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.
2. Reconnect the Radio C7 harness connector.
3. Disconnect the Cellular Antenna harness connector.
4. Connect the (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) (1) to the Radio C7 component connector.
5. Turn the Radio on and select several different known good APP/ Cellular functions.

Is the reception still poor or not available?

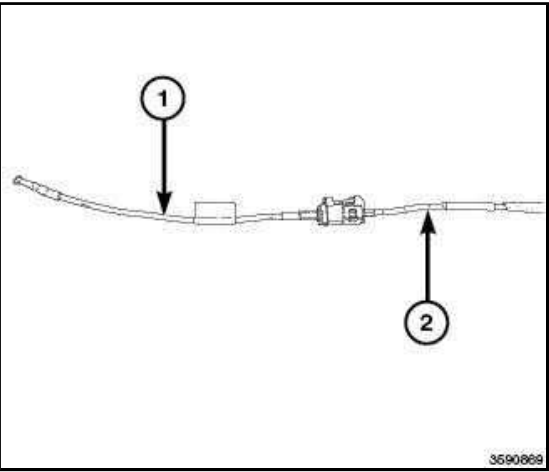
Yes

- Go To [5](#)

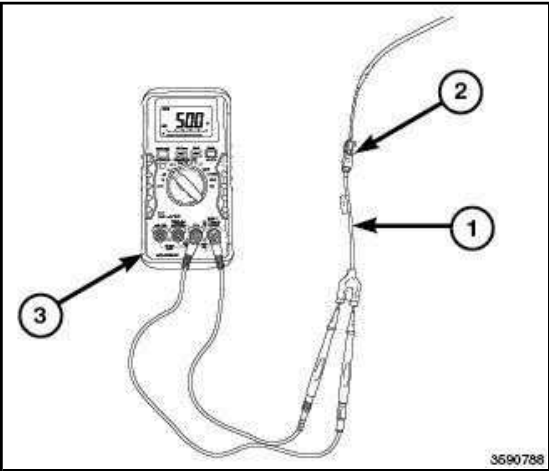
No

- Replace the Cellular Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. ANTENNA CABLE



1. Turn the ignition off.
2. Connect the (special tool #9977-6-CELL-LTE, Adapter, Cellular Antenna Diagnostic) (1) to the Radio C7 component connector.
3. Connect the appropriate (special tool #9977-6-4, Jumper) (1) or (special tool #9977-6-2, Jumper) (1) to the Cellular Antenna harness connector (2) at the Antenna.



4. Connect the appropriate (special tool #9977-6-1, Adapter) (1) or (special tool #9977-6-3, Adapter) (1) to the Radio C7 harness connector (2).

5. Measure the resistance across the tool terminals.
- Is the resistance between 47.5 and 52.5 Ohms?
- Yes
- The source of the poor reception is not caused by the Radio, Cellular Antenna Cable or Cellular Antenna.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- No
- Replace the Cellular Antenna Cable in accordance with the Service Information.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

POOR OR NO GPS RECEPTION

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

POSSIBLE CAUSES

Possible Causes
GPS ANTENNA CONNECTION GPS ANTENNA CABLE GPS ANTENNA RADIO

DIAGNOSTIC TEST

1. ANTENNA INSPECTION
1. Using Service Information locate and verify the antenna is on the vehicle.

2. Visually inspect the Antenna for damage.

Is the antenna missing or damaged?

Yes

- Replace the GPS Antenna in accordance with the Service Information.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [2](#)
2. CHECK THE ANTENNA CONNECTIONS
1. Turn the ignition off.

2. Disconnect the GPS Antenna connector at the Antenna.

3. Disconnect the GPS Antenna connector at the rear of the Radio.

4. Inspect both of the GPS Antenna connections and verify the Antenna is torqued to specification.

Were the antenna connections clean and torqued to specification?

Yes

- Go To [3](#)

No

- Clean the GPS Antenna connection(s) / torque to specification as necessary.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
3. RADIO
- NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Connect the Radio Diagnostic Tool (special tool #9977-6-13, Adapter, Long RF RG-58 Fakra) and (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) to the GPS Antenna connection on the back of the Radio.

2. Place the test antenna base on the roof of the vehicle.

3. Turn the ignition on.

4. Drive the vehicle outside to an un-obstructed area.

5. Turn the Satellite Radio on and select several different known good stations.

Is the reception still poor or not available?

Yes

- Replace the Radio in accordance with the Service Information.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. ANTENNA

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

1. Turn the ignition off.

2. Reconnect the Radio C7 harness connector.

3. Disconnect the GPS Antenna harness connector.

4. Connect the (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) (1) to the Radio C7 component connector.

5. Turn the Radio on.

Is the reception still poor or not available?

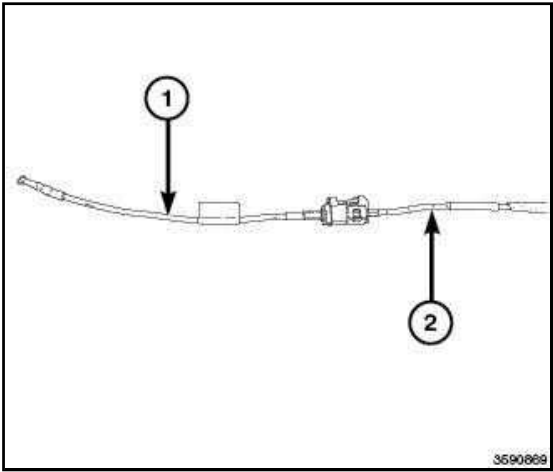
Yes

- Go To [5](#)

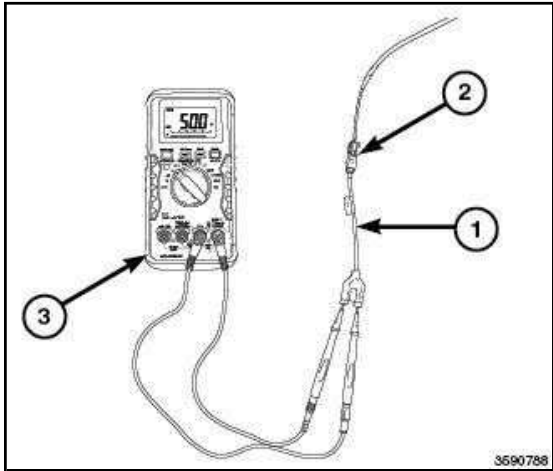
No

- Replace the GPS Antenna in accordance with the Service Information.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. ANTENNA CABLE



1. Turn the ignition off.
2. Connect the (special tool #9977-6-GPS-GLO, Antenna, GPS GLONASS) (1) to the Radio C7 component connector.
3. Connect the appropriate (special tool #9977-6-4, Jumper) (1) or (special tool #9977-6-2, Jumper) (1) to the GPS Antenna harness connector (2) at the Antenna.



4. Connect the appropriate (special tool #9977-6-1, Adapter) (1) or (special tool #9977-6-3, Adapter) (1) to the Radio C7 harness connector (2).
5. Measure the resistance across the tool terminals.

Is the resistance between 47.5 and 52.5 Ohms?

Yes

- The source of the poor reception is not caused by the Radio, Satellite Antenna Cable or Satellite Antenna.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the GPS Antenna Cable in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

DIAGNOSIS AND TESTING REAR CAMERA WITH RADIO DISPLAY

For a complete BACK UP CAMERA SYSTEM wiring diagram, [refer to the appropriate wiring information](#) .

DIAGNOSIS AND TESTING - REAR CAMERA

The hardwired circuits of the Rear View Camera (RVC) and those between the RVC and the radio may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the RVC or the radio. The most reliable, efficient and accurate means to diagnose the electronic controls and communication related to radio operation, as well as the retrieval or erasure of a Diagnostic Trouble Code (DTC) requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Be certain to confirm the following prior to attempting any additional diagnosis or testing of the RVC. Use a diagnostic scan tool to confirm the rear view camera is setup in the vehicle configuration.

NOTE: Be certain the radio has been configured with the latest software. Many radio issues can be resolved by updating the radio to the latest software.

NOTE: For additional information on diagnosing issues with the RVC, see "DIAGNOSIS AND TESTING REAR CAMERA INOPERATIVE WITH RADIO DISPLAY" test. Refer to [DIAGNOSIS AND TESTING REAR CAMERA INOPERATIVE WITH RADIO DISPLAY](#).

NOTE: Prior to starting rear view camera diagnostics, the following step must be performed: With the scan tool, perform the Reset ECU function for the Radio under the Guided Diagnostics menu in the scan tool.

NOTE: When utilizing RG-174 Coax Cable Adapter 9977-6-8 OR a known good camera, the following step must be adhered to prior to checking camera functionality: With the scan tool, perform the Reset ECU function for the Radio under the Guided Diagnostics menu in the scan tool.

REAR VIEW CAMERA DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
VIDEO IMAGE IS BLURRY OR OBSTRUCTIVE	1. Dirt, smear, fingerprints on RVC lens. 2. Ineffective camera shield circuit in the Low Voltage Differential Signal (LVDS) coaxial cable connection at the Radio or RVC 3. Moisture buildup on the inside of the lens	1. Inspect lens for foreign material, and clean lens as required, using the lens cleaning procedure. 7. Inspect the LVDS coaxial cable for damage to the terminals. Check RVC coaxial connection using . Replace as necessary. For additional diagnosis of the RVC, refer to the "Diagnosis And Testing Camera Inoperative With Display Screen" test. Refer to the appropriate information. 3. Replace the ineffective camera as required.
NO VIDEO DISPLAY IN RADIO AND DOES NOT DISPLAY ANY MESSAGE	1. Incorrect radio software 2. Ineffective radio inputs or outputs 3. Ineffective radio 4. Ineffective radio fuse 5. Ineffective radio ground circuit 6. Ineffective radio feed circuit 7. Ineffective LVDS coaxial connection at RVC or LVDS cable	1. Check to be certain that the radio has the latest software update installed. Install the radio software update, if required. 2. Use a diagnostic scan tool to test the radio inputs and outputs including those received over the Controller Area Network (CAN) data bus. Refer to the appropriate diagnostic information. 3. Use a diagnostic scan tool to test the radio. Refer to the appropriate diagnostic information. 4. Test and replace the radio fuses, if required. 5. Check for loose or damaged wiring connections at the radio. Test and repair the open radio ground circuit, if required. 6. Check for loose or damaged wiring connections at the radio. Test and repair the open radio feed circuit, if required. 7. Check the LVDS coaxial cable center terminal for 10 volts (VP2R radios) or 12 volts (VP4R radios). Check RVC LVDS coaxial connection using . Replace as necessary. For additional diagnosis of the RVC, refer to the "Diagnosis And Testing Camera Inoperative With Display Screen" test. Refer to the appropriate information.
CAMERA IMAGE BUT NO GRIDLINES	1. Setting disabled in Radio 2. Incorrect radio software 3. Ineffective Radio 4. Incorrect Body Control Module (BCM) software 5. Ineffective camera LVDS circuit 6. Ineffective camera	1. Check setting in radio to ensure active guideline is enabled. 2. Check to be certain that the radio has the latest software update installed. Install the radio software update, if required. 3. Use a diagnostic scan tool to test the radio. Refer to the appropriate diagnostic information. 4. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information. 5. Check for loose or damaged wiring connections between the camera and the radio. Refer to the appropriate diagnostic information. Replace the section of harness that is damaged, if required. 6. Replace camera.
NO CAMERA IMAGE IN RADIO VIDEO DISPLAY AND NO BACKUP LAMPS IN REVERSE	1. Backup lamps inoperative. 2. Both backup lamps inoperative. 3. Ineffective BCM inputs or outputs.	1. Test and repair the open backup lamp switch output circuit between the right and left tail lamps if required. 2. Test and repair the open backup lamp switch output circuit between the Body Control Module (BCM) and the tail lamps, if required. 3. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
NO CAMERA IMAGE IN RADIO VIDEO DISPLAY - DOES DISPLAY CHECK ENTIRE SURROUNDINGS MESSAGE BRIEFLY AFTER SHIFTING INTO REVERSE AND BACKUP LAMPS DO OPERATE	1. Ineffective camera LVDS coaxial circuit or shield circuit 6. Ineffective camera.	1. Check the LVDS coaxial cable center terminal for 10 volts (VP2R radios) or 12 volts (VP4R radios). Check for loose or damaged wiring connections between the camera and the radio. Refer to the appropriate diagnostic information. Replace the LVDS cable, if required. 6. Replace the ineffective camera, if required.

DIAGNOSIS AND TESTING REAR CAMERA INOPERATIVE WITH RADIO DISPLAY

For a complete BACK UP CAMERA SYSTEM wiring diagram, [refer to the appropriate wiring information](#) .

THEORY OF OPERATION

The Camera is activated when the ignition switch is in the RUN position. The Fused Run Relay Output circuit supplies power to the camera. The camera sends a video signal (std. NTSC i.e. TV) to the Radio using a Low Voltage Digital Signal (LVDS) cable, which displays on the Radio screen. The screen toggles functions displaying only one kind of image at a time. And in reverse, the rear camera has priority.

WHEN MONITORED

Ignition on, vehicle in reverse.

SET CONDITION

No rear picture is displayed on Radio with the vehicle in reverse.

POSSIBLE CAUSES

Possible Causes
FUSED RUN RELAY OUTPUT CIRCUIT
GROUND CIRCUIT
LVDS CABLE
REAR VIDEO CAMERA

DIAGNOSTIC TEST

1. VERIFY OPERATION OF THE RADIO AND BACKUP LAMPS

1. Verify the operation of the Radio and Backup Lamps.

Do the Radio and Backup Lamps operate correctly?

Yes

- Go To 2

No

- Diagnose any problems with the Radio and Backup Lamps.
- Perform the BODY VERIFICATION TEST. Refer to BODY VERIFICATION TEST .

2. CHECK THE (F923) FUSED RUN RELAY OUTPUT CIRCUIT

- Turn the ignition off.
- Apply the parking brake.
- Disconnect the Rear Video Camera Assembly Harness Connector.
- Turn the ignition on.
- Measure the voltage between the (F923) Fused Run Relay Output circuit and ground.

Is battery voltage present?

Yes

- Go To 3

No

- Repair the (F923) Fused Run Relay Output circuit for an open or short to ground.
- Perform the BODY VERIFICATION TEST. Refer to BODY VERIFICATION TEST .

3. CHECK THE (Z916) GROUND CIRCUIT

- Turn the ignition off.
- Measure the resistance between ground and the (Z916) Ground Circuit.

Is the resistance below 5.0 Ohms?

Yes

- Go To 4

No

- Repair the (Z916) Ground circuit for an open.
- Perform the BODY VERIFICATION TEST. Refer to BODY VERIFICATION TEST .

4. CHECK THE (J220) LVDS CABLE

- Disconnect the Central Vision Process Module (CVPM) C4 harness connector.
- Connect test tool cable kit 9977-6-8 to the CVPM and Camera.
- Turn the ignition on.
- Set the parking brake to prevent the vehicle from moving.
- Apply foot to the brake pedal.
- Move the gear selector from PARK to Reverse.
- While maintaining foot pressure on the brake pedal, check the operation of the back up camera on the Radio screen.

Did operation of the camera return to the Radio screen?

Yes

- Replace the LVDS cable.
- Perform the BODY VERIFICATION TEST. Refer to BODY VERIFICATION TEST .

No

- Go To

5. CHECK THE REAR BACK UP CAMERA

- Turn the ignition off.
- Disconnect the vehicle camera from the 9977-6-8 test tool cable kit
- Connect a known good camera.
- Turn the ignition on.
- Make sure the parking brake is set to prevent the vehicle from moving.
- Apply foot to the brake pedal.
- Move the gear selector from PARK to Reverse.
- While maintaining foot pressure on the brake pedal, check the operation of the back up camera on the Radio screen.

Did operation of the camera return to the Radio screen?

Yes

- Replace the Rear View Camera in accordance with Service Information.

No

- Replace the Central Vision Processing Module (CVPM) in accordance with Service Information.
- Perform the BODY VERIFICATION TEST. Refer to BODY VERIFICATION TEST .

DIAGNOSIS-AND-TESTING-SPEAKER

For a complete AUDIO SYSTEM BASE/PREMIUM wiring diagram, refer to the appropriate wiring information .

DIAGNOSIS AND TESTING - SPEAKER

Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

Refer to the appropriate wiring information.

WARNING: Disable the airbag system before attempting any steering wheel, steering column, seat belt tensioner, side airbag or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable. Wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

CAUTION: The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

Speaker Buzz, Squeak, Rattle (BSR) Diagnosis and Testing

1. Begin by verifying the customer complaint. The exact conditions that caused the issue for the customer must be used. Pay close attention to the following details
 1. Type of input (FM, AM, XM, CD)
 2. Volume Level
 3. Audio settings, including bass and treble
2. Once the complaint has been reproduced, clear the map pocket and storage bins of all loose items around the speaker in question.
3. Attempt to reproduce the issue in a non-radio mode, such as CD, BluetoothB®, or Auxiliary Input. This will help determine if it is a speaker issue or a reception issue.
4. If the speaker noise is still present, visit the Tech Connect home page / Service Library Dashboard and follow the instructions to download the Audio Test Files for Speaker Diagnosis to a USB drive.
5. Insert the USB drive in the proper input of the vehicle, and then set the following radio settings:
 1. Bass at maximum
 2. Mid and treble at neutral
 3. Volume at step 30
6. Play all of the frequencies on the USB drive with the recommended settings. When a frequency reproduces the noise, press the interior panels around the speaker to see if the noise subsides. It may be necessary to replace broken trim clips or use foam tape to correct a speaker noise issue. Refer to the service information for additional details.

Electrical Diagnosis and Testing

1. Turn the ignition ON. Using the scan tool confirm the radio and (if equipped) the amplifier are active on the bus. If OK go to **Step 2** . If not OK refer to the NO RESPONSE FROM ECU diagnosis and testing in COMMUNICATION before proceeding further with this test.
2. Using the scan tool confirm the following:
 1. No audio related (radio, amplifier etc.) DTCs.
 2. No configuration, communication DTCs.

If OK go to **Step 3** . If not OK refer to the appropriate DTC test for repairs before proceeding further with this test.

3. Turn the radio ON. Adjust the balance and fader controls to check the performance of each individual speaker.

NOTE: Subwoofer channel will not fade forward or rearward. Use the bass control to check the subwoofer channel output.

What is the audio condition of **all** speaker locations?

1. Audio cannot be heard in any speaker. Go to **Step 16**
 2. Audio can be heard in one or more speaker. Go to **Step 4**
4. Audio configuration of the vehicle.

Does this vehicle have an amplifier?

1. Yes this vehicle has an amplifier Go to **Step 5**
2. No this vehicle does not have an amplifier Go to **Step 11**

5. (from Step 4) **RADIO/AMPLIFIER CONFIGURED VEHICLE**

Turn the radio OFF. Turn the ignition to the OFF position. Disconnect and isolate the battery negative cable. Remove the radio from the instrument panel. Disconnect the corresponding radio wiring harness connector at the amplifier. For each inoperative speaker location, check each speaker feed (+) and return (-) circuits between the radio and amplifier at the radio wire harness connector for the following:

1. Open/High Resistance (there should be continuity / approximately 1 to 1.5 ohms)
2. Short To Ground
3. Short To Voltage
4. Short To Another Circuit

NOTE: In each case, there should be no open or shorts.

If OK, go to **Step 6** . If not OK, repair the open or shorted speaker feed (+) and or return (-) circuit(s) between the radio and amplifier connectors as required.

6. Install the radio. Connect the battery negative cable. Check for battery voltage at the fused B(+) fuse for the amplifier in the Power Distribution Center (PDC). If OK, go to **Step 7** . If not OK, repair the open fused B(+) circuit to the PDC fuse as required.
7. Check for battery voltage at the fused B(+) circuit cavities of the amplifier wire harness connector. If OK, go to **Step 8** . If not OK, repair the open fused B(+) circuit(s) to the amplifier fuse in the junction block as required.
8. Turn the ignition switch to the ON position. Turn the radio ON. Check for battery voltage at the enable signal to amplifier circuit cavity of the amplifier wire harness connector. If OK, go to **Step 9** . If not OK, repair the open enable signal to amplifier circuit to the radio as required.
9. Turn the radio OFF. Turn the ignition switch to the OFF position. Disconnect and isolate the battery negative cable. For each inoperative speaker location, check each amplifier speaker feed (+) circuit and return (-) circuit of the amplifier, between the amplifier and speaker at the amplifier wire harness connectors for the following:
 1. Open/High Resistance (there should be continuity / approximately 1 to 1.5 ohms)
 2. Short To Ground
 3. Short To Voltage
 4. Short To Another Circuit

NOTE: In each case, there should be no open or shorts.

If OK, go to **Step 10** . If not OK, repair the open or shorted speaker feed (+) and or return (-) circuit(s) between the amplifier and speaker connectors as required.

10. For each inoperative speaker location, check the resistance of the speaker. The meter should read between 1 and 10 ohms (speaker resistance).

If OK, replace the amplifier first. **If the condition is still present** replace the radio.

If not OK, replace the faulty speaker.

11. (from Step 4) **RADIO ONLY CONFIGURED VEHICLE**

Turn the radio OFF. Turn the ignition switch to the OFF position. Disconnect and isolate the battery negative cable. For each inoperative speaker location, check each radio speaker feed (+) circuit and return (-) circuit of the radio, between the radio and speaker at the radio wire harness connectors for the following:

1. Open/High Resistance (there should be continuity / approximately 1 to 1.5 ohms)
2. Short To Ground
3. Short To Voltage
4. Short To Another Circuit

NOTE: In each case, there should be no open or shorts.

If OK, go to **Step 12** . If not OK, repair the open or shorted speaker feed (+) and or return (-) circuit(s) between the radio and speaker connectors as required.

12. Check for continuity between the ground circuit cavities of the radio wire harness connector and a good ground. There should be continuity. If OK, go to **Step 13** . If not OK, repair the open ground circuit(s) to ground as required.
13. Install the radio. Connect the battery negative cable. Check for battery voltage at the fused B(+) fuse for the radio in the Power Distribution Center (PDC). If OK, go to **Step 14** . If not OK, repair the open fused B(+) circuit to the PDC fuse as required.
14. Check for battery voltage at the fused B(+) circuit cavities of the radio wire harness connector. If OK, go to **Step 15** . If not OK, repair the open fused B(+) circuit(s) to the amplifier fuse in the junction block as required.
15. For each inoperative speaker location, check the resistance of the speaker. The meter should read between 1 and 10 ohms (speaker resistance).

If OK, replace the faulty radio.

If not OK, replace the faulty speaker.

16. (from Step 3) **AUDIO CANNOT BE HEARD IN ANY SPEAKER**

Check the audio configuration of the vehicle.

Does this vehicle have an amplifier?

1. Yes this vehicle has an amplifier Go to **Step 17**
2. No this vehicle does not have an amplifier Go to **Step 20**

17. (from Step 16) **RADIO/AMPLIFIER CONFIGURED VEHICLE**

Check for battery voltage at ALL power supply fused B(+)/ignition related circuits to the amplifier. If OK, go to **Step 18** . If not OK, repair the circuits for an open or high resistance as required.

18. Check ALL ground related circuits to the amplifier. If OK, go to **Step 19** . If not OK, repair the ground circuit(s) for an open or high resistance as required.

19. Remove the radio from the instrument panel. Disconnect the corresponding radio wiring harness connector at the amplifier. For each inoperative speaker location, check each speaker feed (+) and return (-) circuits between the radio and amplifier at the radio wire harness connector for the following:
1. Open/High Resistance (there should be continuity / approximately 1 to 1.5 ohms)
 2. Short To Ground
 3. Short To Voltage
 4. Short To Another Circuit

NOTE: In each case, there should be no open or shorts.

If OK, replace the amplifier first. **If the condition is still present** replace the radio.

If not OK, repair the open or shorted speaker feed (+) and or return (-) circuit(s) between the radio and amplifier connectors as required.

20. (from Step 16) **RADIO ONLY CONFIGURED VEHICLE**

Check for battery voltage at ALL power supply fused B(+)/ignition related circuits to the Radio. If OK, go to **Step 21** . If not OK, repair the circuits for an open or high resistance as required.

21. Check ALL ground related circuits to the radio. If OK, go to **Step 22** . If not OK, repair the ground circuit(s) for an open or high resistance as required.

22. For each inoperative speaker location, check each speaker feed (+) and return (-) circuits between the radio and speaker at the radio wire harness connector for the following:
1. Open/High Resistance (there should be continuity / approximately 1 to 1.5 ohms)
 2. Short To Ground
 3. Short To Voltage
 4. Short To Another Circuit

NOTE: In each case, there should be no open or shorts.

If OK, then replace the radio.

If not OK, repair the open or shorted speaker feed (+) and or return (-) circuit(s) between the radio and speaker connectors as required.

DIAGNOSIS AND TESTING - REMOTE SWITCHES

Any diagnosis of the Audio system should begin with the use of the scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.

For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: Disable the airbag system before attempting any steering wheel, steering column, seat belt tensioner, side airbag or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable. Wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

1. Disconnect and isolate the negative battery cable. Remove the remote radio switch(es) from the steering wheel. Go to **Step 2** .
2. Use an ohmmeter to check the switch resistances as shown in the Remote Radio Switch Test table below, then Go to **Step 3** .

REMOTE RADIO SWITCH TEST				
Switch	Switch Position	Minimum Resistance (kilo-ohm)	Nominal Resistance (kilo-ohm)	Maximum Resistance (kilo-ohm)
Right (White)	Volume Up	6.732	6.8	6.868
Right (White)	Volume Down	14.850	15	15.151
Right (White)	Mode Advance	0	0	0
Left (Black)	Seek Up	1.188	1.2	1.212
Left (Black)	Seek Down	3.267	3.3	3.333
Left (Black)	Pre-Set Station Advance	0.465	0.47	0.474

3. If the switch resistance checks OK, go to **Step 4** . If not OK, replace the ineffective switch.
4. Check for continuity between the ground circuit cavity of the steering wheel wire harness connectors for the switches and a good ground. There should be continuity. If OK, go to **Step 5** . If not OK, repair the open ground circuit as required.
5. Disconnect the appropriate wire harness connector from the Body Control Module (BCM). Check for continuity between the radio control circuit cavity of the steering wire harness connectors for the switches and a good ground. There should be no continuity. If OK, go to **Step 6** . If not OK, repair the shorted radio control circuit as required.
6. Check for continuity between the radio control circuit cavities of the steering wheel wire harness connectors for the switches and the BCM wire harness connector. There should be continuity. If OK, use a diagnostic scan tool and the appropriate diagnostic procedures to test the BCM, the Radio and the Controller Area Network (CAN) data bus. If not OK, repair the open radio control circuit as required.

MULTI-MEDIA TEST

MULTI-MEDIA TESTING FUNCTION

Any diagnosis of the Audio system should begin with duplicating the customer concern (verify the problem), include checking for applicable Technical Service Bulletins (TSB), Star Online Publications, software updates and the use of a diagnostic scan tool. Check for any Diagnostic Trouble Code (DTC) data. If a DTC is found, refer to - Radio and perform the appropriate diagnostic procedure before proceeding in this information.

The multi-media test was developed to help diagnose and determine the cause of customer concerns with features of the multi-media systems in the vehicle.

There are 9 specific functionality tests available for the multi-media systems:

1. Operation of the AUX port
2. Operation of the USB port for both power and Audio input concerns
3. BluetoothB® phone pairing
4. BluetoothB® hands free calling (send & receive) phone book push test
5. BluetoothB® streaming audio
6. BluetoothB® SMS messaging - send
7. BluetoothB® SMS messaging - receive
8. No BluetoothB® signal available
9. No WiFi signal available

It is important to determine the system features supported by the vehicle's multi-media systems, customer's personal device and their compatibility with another.

The following websites are available to customers and dealership personnel for information on device compatibility, operation and supported features of the vehicle's multi-media systems:

- For device compatibility, refer to <http://www.driveuconnect.com>
- <http://www.dodge.com/en/uconnect>
- <http://www.chrysler.com/en/uconnect>
- <http://www.jeep.com/en/uconnect>
- <http://www.ramtrucks.com/en/uconnect>
- <http://www.fiatusa.com/en/BlueAndMe>

NOTE: Prior to performing any testing of the multi-media systems, the compatibility between the customer's personal device and the vehicle's multi-media systems must be confirmed

When testing the functions of the multi-media systems, it is important to verify whether or not the vehicle is equipped with an internal or external Hands Free Module. In some cases the external Hands Free Module controls the operation of the external AUX and USB ports along with the UconnectB® functions. A WiFi subscription package may be required for purchasing, and the feature activated to function properly on select equipped vehicles. For further details consult the owner manual and <http://www.driveuconnect.com>

The following websites are available to dealership personnel only for further technical information of the vehicle's multi-media systems:

- DealerCONNECT
- Service Library
- STAR Online Publications
- Technical Service Bulletins
- wiTECH™ for radio updates
- FCA PERFORMANCE INSTITUTE

MULTI-MEDIA FUNCTIONALITY TESTS

1. **CONFIRM THE COMPATIBILITY OF THE CUSTOMER'S PERSONAL DEVICE TO THE VEHICLES MULTI-MEDIA SYSTEM**

1. Check the compatibility of the customer's personal device with the website <http://www.driveuconnect.com>.

Is the customer's personal device compatible to the vehicles multi-media system?

Yes

- Go To [2](#)

No

- The customer's device is not compatible with the vehicles multi-media system.
- Check the customer's device for related updates and support.

2. FUNCTIONALITY TESTS FOR THE MULTI-MEDIA SYSTEMS USING A KNOWN GOOD COMPATIBLE SMART PHONE

1. Turn the ignition on.

- NOTE:** The following are required to proceed with testing:
- Confirmation of a compatible smart phone from the website <http://www.driveuconnect.com>
 - The use of a known good compatible smart phone and cable. The known good compatible smart phone will be referred to as "Test Phone A ".

2. AUXILIARY INPUT JACK TEST

- Go To [3](#)

3. USB INPUT/OUTPUT TEST

- Go To [4](#)

4. BLUETOOTH PAIRING

- Go To [11](#)

5. BLUETOOTH HANDS FREE CALLING/PHONEBOOK PUSH TEST

- Go To [12](#)

6. BLUETOOTH STREAMING AUDIO TEST

- Go To [13](#)

7. BLUETOOTH SMS MESSAGING - RECEIVE

- Go To [14](#)

8. BLUETOOTH SMS MESSAGING - SEND

- Go To [15](#)

9. NO BLUETOOTH SIGNAL AVAILABLE

Vehicles built with Sales Code RFV - DISASSOCIATED TOUCHSCREEN DISPLAY using the dual WIFI-BT antenna connections

- Go To [16](#)

10. NO WIFI SIGNAL AVAILABLE

Vehicles built with Sales Code RFV - DISASSOCIATED TOUCHSCREEN DISPLAY using the dual WIFI-BT antenna connections

- Go To [17](#)

3. AUXILIARY INPUT JACK TEST

- NOTE:** This test is designed to validate the ability of the multi-media system to play audio from a customer's device that has been connected to the AUX port on the radio or externally through a UCI (Universal Customer Interface / Multi-Media) port.

- NOTE:** The AUX port cannot supply power to a connected device.

1. Using a known good Auxiliary Cable, connect the Auxiliary Cable to the vehicle's audio port.
2. Connect the Auxiliary Cable to **Test Phone A** .
3. Select an audio file from **Test Phone A** to be heard with the volume all the way up.
4. Using the vehicle controls, place the audio system into AUX (Line In) Mode. (Audio system may automatically enter into AUX Mode.)

Does the Radio play audio from Test Phone A?

Yes

- Audio playback confirms that the Auxiliary Input is working correctly, no system repairs are needed at this time.
- Check the condition of the customer's cords and device being used.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone).
- Check the customer's device for output and volume setting concerns.
- Check the customer's device for updates relating to the customer's concern.

No

- If Audio playback does not occur, refer to the appropriate Service Information and repair or replace as needed.
- Check the Multi-Media ports for damaged connection points or debris in the ports.
- Check wiring circuits and connections related to the AUX port for concerns.
- Check for vehicle related system updates, STAR cases and TSBs related to the customer's concern.
- If no updates are available for the concern or wiring problems are found, replace the Radio or Hands Free Module in accordance with the Service Information.

4. USB INPUT/OUTPUT TEST

- NOTE:** This test is designed to validate the ability of the multi-media system to play audio from a customer's device that has been connected to the USB port on the radio or the external USB port (Universal Customer Interface (UCI) / Multi- Media port). By connecting Test Phone A to the USB ports it will also determine if the USB port can provide power to a connected device.

1. Confirm the USB port is not a **Charge only** port.
2. Using a known good USB Cable, connect the USB Cable to the vehicle's USB port.
3. Connect the USB Cable to **Test Phone A** .
4. Select an audio file from **Test Phone A** to be heard with the volume all the way up.
5. Using the vehicle controls, place the audio system into USB Mode. (Audio system may automatically enter into USB Mode.)

Does the Radio play audio from Test Phone A?

Yes

- Audio playback confirms that the USB Input is working correctly, no system repairs are needed at this time.
- Check the condition of the customer's cords and device being used.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone).
- Check to make sure the customer's device and cables are compatible with the vehicle system.
- Check the customer's device for output and volume setting concerns.
- Check the customer's device for updates relating to the customer's concern.

No

- Go To [5](#)

5. CHECK THE USB PORT FOR DAMAGE

1. Check the Multi-Media ports for damaged connection points or debris in the ports.

Was damage to the connections point or debris found in the ports?

Yes

- Repair or replace the Multi-Media port as needed.

No

- Go To [6](#)

6. CHECK THE FUNCTION OF THE USB PORT

- NOTE:** Confirm the USB flash drive (with music files i.e. mp3) will play in another known good vehicle and Laptop computer before proceeding.

1. Insert a USB Flash drive (with music files i.e. mp3) in to the Media Port / USB port.

Does the Radio play audio from USB Flash drive?

Yes

- **Audio playback confirms that the USB Input is working correctly, no system repairs are needed at this time.**
- Check the condition of the customer's cords and device being used.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone)).
- Check the customer's device for output and volume setting concerns.
- Check the customer's device for updates relating to the customer's concern.

No

- Go To [7](#)

7. CHECKING THE USB PORT

1. Remove the USB Flash drive (with music files i.e. mp3) from the Media Port / USB port
2. Turn the ignition off.
3. Remove the Media Port from the Dash/Console.
4. Disconnect the gray USB cable connector from the Media Port.
5. Using a USB A Male to Mini B cable, connect the Mini B connection to the Media Port and the A Male connection to a Laptop computer.
6. Turn the ignition on.
7. Insert the USB Flash drive (with music file i.e. mp3s) in to the Media Port / USB port
8. Using the Laptop computer, select the flash drive.

Does the Laptop computer recognize the USB Flash drive?

Yes

- Go To [10](#)

No

- Go To [8](#)

8. ISOLATE AND LOAD TEST THE POWER SUPPLY RELATED CIRCUIT TO THE MEDIA PORT FOR A SHORT TO GROUND, OPEN, OR HIGH RESISTANCE

1. Check the fuse for an open. If the fuse is open, make sure to check for a short to ground prior to replacing the fuse.
2. The ignition must be off when performing a load test on a circuit.
3. Isolate the circuit by disconnecting the Media Port and all other harness connectors containing the circuit being tested.
4. Connect the positive lead of the load test tool to the positive side of the Battery (A). Refer to the diagram below.
5. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the Media Port connector (B).
6. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the Power Distribution Center (PDC) harness connector (C and D).
7. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

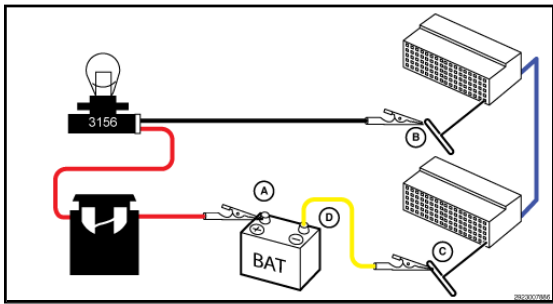
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the circuit(s) for an open or high resistance.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

9. CHECK THE GROUND CIRCUIT TO THE MEDIA PORT BY LOAD TESTING THE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Disconnect the Media Port harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the Media Port harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

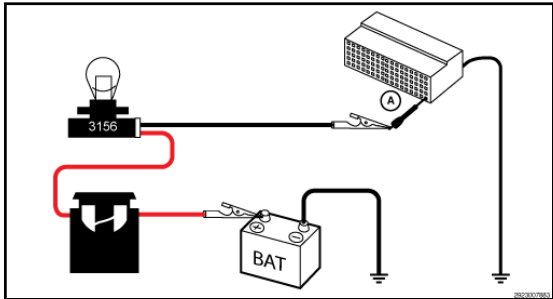
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at the harness connector, always use an appropriate back probing tool to prevent any possible damage to the terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Replace the Media Port in accordance with Service Information.

No

- Repair the ground circuit(s) for an open or high resistance.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

10. CHECKING THE UCI/USB CABLE

1. Turn the ignition off.
2. Remove the USB Flash drive (with music files i.e. mp3) from the Media Port / USB port
3. Disconnect the USB A Male to Mini B cable from the Media Port.
4. Disconnect the UCI/USB cable from connector going from the external Hands Free Module (if equipped) or Radio to the Media port.
5. Connect the (special tool #9977-6-11, Kit, USB Mini-B - 4 and 5 Wire)in to the Hands Free Module (if equipped) or Radio and to the Media port.
6. Turn the ignition on.
7. Insert the USB Flash drive (with music file i.e. mp3s) in to the Media Port / USB port

Does the Radio play audio from USB Flash drive?

Yes

- Replace the UCI/USB cable between the Hands Free Module (if equipped) or Radio and the Media port.

No

- Replace the Hands Free Module (if equipped) or Radio in accordance with Service Information.

11. BLUETOOTH PAIRING (IF EQUIPPED)

NOTE: This test is designed to validate the pairing ability of the vehicles multi-media system. Pairing Test Phone A to the vehicle system will confirm the system operation.

Before testing, it is important to check the total number of devices paired to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer's concern is the vehicle system was working with their device but then stopped working correctly, verify and perform the following:

- Check to see if the device was recently updated.
- Clear the device pairing from the system.
- Reboot the customer's device.
- Re-pair the device to the vehicle system.
- Check the operation.

At times, cell phone providers will update the software or firmware in the customer's device (without the customer knowing) causing it to become out of sync with the vehicle's system.

NOTE: During this test, use the power outlet to supply the power and ground to Test Phone A . This will confirm and demonstrate the BluetoothB® connection without anything connected to the multi-media system ports.

1. Turn on BluetoothB® mode in Test Phone A .
2. Use the vehicle audio controls to place the audio system into ready to PAIR Mode.
3. When prompted, enter the Pairing Pin number.

Does Test Phone A pair to the multi-media system?

Yes

- If the Test Phone A pairs to the system, the Hands Free connection is working correctly, no part replacement is needed.
- Check the total number of devices paired to the customer's device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone).
- Check to see if the customer's device supports the vehicle feature being tested.
- Check the customer's device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.

No

- If the vehicle is equipped and pairing does not occur, refer to the appropriate Service Information.
- Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
- If no updates are available for the concern, replace the Radio or Hands Free Module in accordance with the Service Information.

12. BLUETOOTH HANDS FREE CALLING / PHONE BOOK PUSH TEST

NOTE: This test is designed to validate the ability of the multi-media system to place and receive phone calls.

This test will require the use of Test Phone A and a fully functioning phone. The fully functioning phone will be identified as "Test Phone B " in this diagnostic test step.

Before testing, it is important to check the total number of devices paired to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer's concern is the vehicle system was working with their device but then stopped working correctly, verify and perform the following:

- Check to see if the device was recently updated.
- Clear the device pairing from the system.
- Reboot the customer's device.
- Re-pair the device to the vehicle system.
- Check the operation.

At times, cell phone providers will update the software or firmware in the customer's device (without the customer knowing) causing it to become out of sync with the vehicle's system.

NOTE: During this test use the Power outlet adaptor supplied with the power and ground to Test Phone A . This will confirm and demonstrate the BluetoothB® connection without anything connected to the multi-media system ports.

1. Turn on BluetoothB® mode in Test Phone A .
2. Pair Test Phone A to the vehicle.
3. Create and save the Test Phone B contact information (name and number) into Test Phone A .
4. From Test Phone B , call Test Phone A .
5. The vehicle should announce an incoming call.
6. The media system should display the Test Phone B contact information, confirming a successful push of the phone book.
7. Using the vehicle controls, answer the call.
8. Using the vehicle controls, end the call.

Was the contact information displayed and the call completed?

Yes

- **The system is working correctly; no part replacement is needed.**
- Check the total number of devices paired to the customer's device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone)).
- Check to see if the customer's device supports the feature that the customer is trying to use.
- Check the customer's device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

No

- **Reference the appropriate Service Information.**
- Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
- If no updates are available for the concern, replace the Radio or Hands Free Module in accordance with the Service Information.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

13. BLUETOOTH STREAMING AUDIO TEST

NOTE: This test is designed to validate the ability of the multi-media system to play streamed audio by a BluetoothB® connected device.

Before testing, it is important to check the total number of devices paired to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer's concern is the vehicle system was working with their device but then stopped working correctly, verify and perform the following:

- **Check to see if the device was recently updated.**
- **Clear the device pairing from the system.**
- **Reboot the customer's device.**
- **Re-pair the device to the vehicle system.**
- **Check the operation.**

At times, cell phone providers will update the software or firmware in the customer's device (without the customer knowing) causing it to become out of sync with the vehicle's system.

NOTE: During this test use the Power outlet to supply the power and ground to Test Phone A . This will confirm and demonstrate the BluetoothB® connection without anything connected to the multi-media system ports.

1. Turn on BluetoothB® mode in **Test Phone A** .
2. Pair **Test Phone A** to the vehicle.
3. Select an audio file from **Test Phone A** to play with the volume all the way up.
4. Using the vehicle controls, place the audio system into BluetoothB® Audio.

Does the Radio play audio from the known good device?

Yes

- **Audio playback will confirm that the BluetoothB® Streaming Audio is working correctly, no system part replacement is needed.**
- Check the total number of devices paired to the customer's device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone)).
- Check to see if the customer's device supports the vehicle feature being tested.
- Check the customer's device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

No

- **If Audio playback does not occur, refer to the appropriate Service Information.**
- Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
- If no updates are available for the concern, replace the Radio or Hands Free Module in accordance with the Service Information.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

14. BLUETOOTH SMS MESSAGING- RECEIVE

NOTE: This test is designed to validate the ability of the multi-media system to receive a SMS message.

This test will require the use of Test Phone A and a fully functioning phone capable of sending and receiving SMS messaging. The fully functioning phone capable of sending and receiving SMS messaging will be identified as "Test Phone B " in this diagnostic test step.

Before testing, it is important to check the total number of devices paired to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer's concern is the vehicle system was working with their device but then stopped working correctly, verify and perform the following:

- **Check to see if the device was recently updated.**
- **Clear the device pairing from the system.**
- **Reboot the customer's device.**
- **Re-pair the device to the vehicle system.**
- **Check the operation.**

At times, cell phone providers will update the software or firmware in the customer's device (without the customer knowing) causing it to become out of sync with the vehicle's system.

NOTE: During this test use the Power outlet to supply the power and ground to Test Phone A . This will confirm and demonstrate the BluetoothB® connection without anything connected to the multi-media system ports.

1. Turn on BluetoothB® mode in **Test Phone A** .
2. Pair **Test Phone A** to the vehicle.
3. Create and save the **Test Phone B** contact information (name and number) into **Test Phone A** .
4. From **Test Phone B** , create and then send a text message to **Test Phone A** .
5. The vehicle audio system should confirm the receipt of a new message.
6. The media system will display the **Test Phone B** contact information, confirming a successful push of the phone book.
7. Using the vehicle controls, retrieve the message to verify proper functionality.

Does the Radio display the message from Test Phone B?

Yes

- **If functioning correctly, no system part replacement is needed.**
- Check the total number of devices paired to the customer's device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone)).
- Check to see if the customer's device supports the vehicle feature being tested.
- Check the customer's device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

No

- **If the Audio system does not display the new message, reference the appropriate Service Information on system operation and supported features. See the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.**
- Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
- If no updates are available for the concern, replace the Radio or Hands Free Module in accordance with the Service Information.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

15. BLUETOOTH SMS MESSAGING-SEND

NOTE: This test is designed to validate the ability of the multi-media system to send a SMS message from the list of preset messages.

This test will require the use of Test Phone A and a fully functioning phone capable of sending and receiving SMS messaging. The fully functioning phone capable of sending and receiving SMS messaging will be identified as "Test Phone B " in this diagnostic test step.

Before testing, it is important to check the total number of devices paired to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer’s concern is the vehicle system was working with their device but then stopped working correctly, verify the following:

- Check to see if the device was recently updated.
- Clear the device pairing from the system.
- Reboot the customer’s device.
- Re-pair the device to the vehicle system.
- Check the operation.

At times, cell phone providers will update the software or firmware in the customer’s device (without the customer knowing) causing it to become out of sync with the vehicle’s system.

NOTE: During this test use the Power to supply the power and ground to Test Phone A . This will confirm and demonstrate the BluetoothB® connection without anything connected to the multi-media system ports.

1. Turn on BluetoothB® mode in **Test Phone A** .
2. Pair **Test Phone A** to the vehicle.
3. Create and save the **Test Phone B** contact information (name and number) into **Test Phone A** .
4. Using the vehicle controls, create and then send a text message to **Test Phone B** .
5. The message should display in **Test Phone B** .

Does Test Phone B display the message sent by Test Phone A?

Yes

- **If functioning correctly, no system part replacement is needed.**
- Check the total number of devices paired to the customer’s device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone).
- Check to see if the customer’s device supports the vehicle feature being tested.
- Check the customer’s device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

No

- **If Test Phone B does not display the new message, reference the appropriate Service Information on system operation and supported features. See the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.**
- Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
- If no updates are available for the concern, replace the Radio or Hands Free Module in accordance with the Service Information.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

16. NO BLUETOOTH SIGNAL AVAILABLE

NOTE: This test is designed to validate the BluetoothB® signal availability in the vehicles multi-media system that are configured with Sales Code RFV - DISASSOCIATED TOUCHSCREEN DISPLAY .

A WiFi subscription package may be required for purchasing, and the feature activated to function properly on select equipped vehicles. For further details consult the owner manual and <http://www.driveuconnect.com>

Before testing, it is important to check the total number of devices paired or linked to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer’s concern is the vehicle system was working with their device but then stopped working correctly, verify the following:

- Check to see if the device was recently updated.
- Clear the device pairing from the system.
- Reboot the customer’s device.
- Re-pair the device to the vehicle system.
- Check the operation.

At times, cell phone providers will update the software or firmware in the customer’s device (without the customer knowing) causing it to become out of sync with the vehicle’s system.

NOTE: During this test use the Power outlet to supply the power and ground to Test Phone A .

1. Confirm that the Bluetooth feature has been turned on in **Test Phone A** .
2. Pair **Test Phone A** to the vehicle.

NOTE: Antenna reception testing

must

be done outside and away from man made structures or natural features to ensure all signals are not obstructed.

3. Disconnect the Radio WiFi / BT Antenna harness connector from the Radio.
4. Connect the (special tool #9977-6-9, Adapter, RG-58 Coax Cable) and the (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth) to the Radio at the WiFi / BT Antenna connector location.
5. Select an audio file from **Test Phone A** to play with the volume all the way up.
6. Using the vehicle controls, place the audio system into BluetoothB® Audio.

Does the Radio play audio from the known good device?

Yes

- **Audio playback will confirm that the BluetoothB® Streaming Audio is working correctly, no system part replacement is needed.**
- Check the total number of devices paired to the customer’s device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone).
- Check to see if the customer’s device supports the vehicle feature being tested.
- Check the customer’s device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

No

- **If Audio playback does not occur, refer to the appropriate Service Information.**
- Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
- If no updates are available for the concern, replace the Radio in accordance with the Service Information.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

17. NO WIFI SIGNAL AVAILABLE

NOTE: This test is designed to validate the WiFi signal availability in the vehicles multi-media system that are configured with Sales Code RFV - DISASSOCIATED TOUCHSCREEN DISPLAY .

A WiFi subscription package may be required for purchasing, and the feature activated to function properly on select equipped vehicles. For further details consult the owner manual and <http://www.driveuconnect.com>

Before testing, it is important to check the total number of devices paired or linked to the vehicles system. Each system has a limit to the number of items that can be paired to the system. For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.

NOTE: If the customer’s concern is the vehicle system was working with their device but then stopped working correctly, verify the following:

- Check to see if the device was recently updated.
- Clear the device pairing from the system.
- Reboot the customer’s device.
- Re-pair the device to the vehicle system.
- Check the operation.

At times, cell phone providers will update the software or firmware in the customer’s device (without the customer knowing) causing it to become out of sync with the vehicle’s system.

1. Disconnect the Radio WiFi / BT Antenna harness connector from the Radio.
2. Connect the (special tool #9977-6-9, Adapter, RG-58 Coax Cable) and the (special tool #9977-6-WiFi-BT, Antenna, WiFi Blue Tooth) to the Radio at the WiFi / BT Antenna connector location.
3. Confirm the following:

- A data source is connected to the system for streaming access. Some of these options can be an in-vehicle 4G Wi-Fi hot spot, capable Wi-Fi hot spot from a mobile device, or Wi-Fi from an outside source like a home or a garage.
- To access Fire TV on the front screen, select "Launch Source" on the front radio rear seat screen and then "Fire TV Home" under the Inputs.
- The menu bar for Fire TV will have the options for "Home", "Find", "Library", "Brand", and "Live".
- Below the menu bar will be streaming options linked to your Prime account like "Prime Video".

4. The front radio screen has the following options:

- Power - This will turn Fire TV on or off.
- Screen 1 and Screen 2 Toggle (if equipped) - This toggles between the Rear Screens (for use with front radio screen only).
- Collapse - While viewing on the front radio screen, this will collapse the screen to dashboard view.
- Source Drawer - This will open the "Source Drawer" and the source logo will be displayed on the icon.
- Browse Media - This will open the "Browse Media" pop-up.
- Back - This will let you go back the previous page.
- Fire TV Home - This will take you back to the Fire TV home page.
- Menu - This will open the Fire TV menu.
- Remote icon - This will display the on-screen remote.

NOTE: Front screen viewing and watching can only be done when the vehicle is in PARK. The rear screens will always launch with Fire TV.

NOTE: During this test use the Power outlet to supply the power and ground to Test Phone A . This will confirm and demonstrate the WIFI connection without anything connected to the multi-media system ports.

5. Turn the ignition on.

6. Turn the Radio on and navigate / browse the media using **Test Phone A** .

Does the Radio allow WiFi navigation / browsing from the known good device?

Yes

- **The WiFi navigation / browsing will confirm the system is working correctly, no system part replacement is needed.**
- Check the total number of devices paired to the customer's device.
- Check to make sure the customer's device and cables are compatible with each other (i.e. Apple Phone with MFi (Made For iPhone)).
- Check to see if the customer's device supports the vehicle feature being tested.
- Check the customer's device for concerns related to password locks, phone book transfer settings and data transfer locks/settings.
- For more information on system operation and supported features see the vehicle supporting website "For Owners Page" or the Drive UconnectB® website at <http://www.driveuconnect.com>.
- **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**

No

- **If WiFi navigation / browsing does not occur, refer to the appropriate Service Information.**
 - Check for vehicle related system updates, STAR cases and TSBs related to the customers concern.
 - If no updates are available for the concern, replace the Radio in accordance with the Service Information.
 - **If Test Phone A does not belong to the customer, delete this paired phone only from the vehicle.**
-

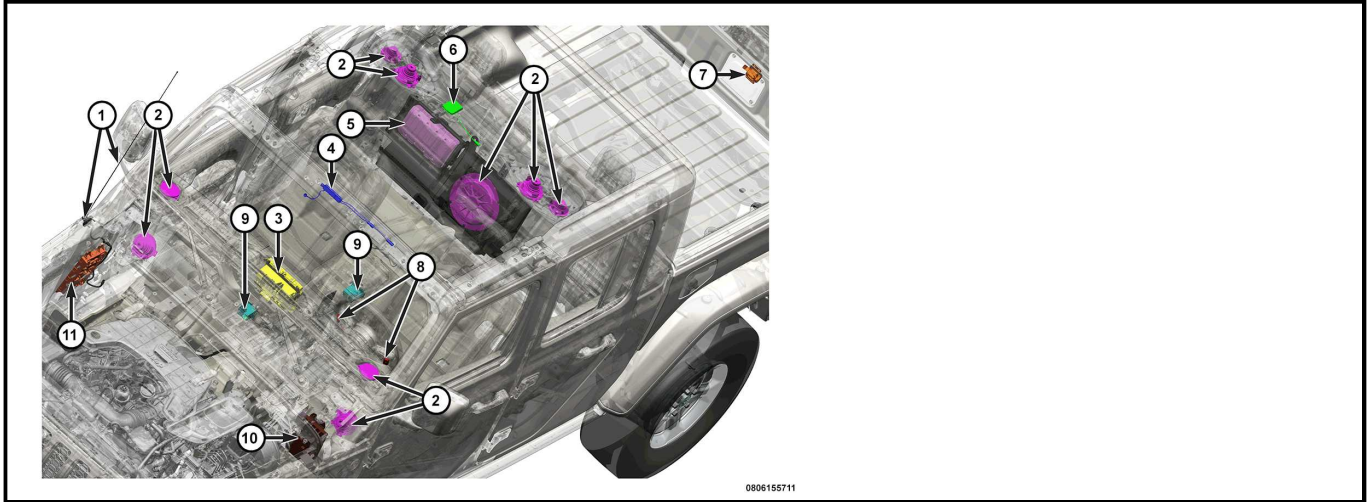
2021 ACCESSORIES AND EQUIPMENT

Audio/Video/Entertainment/Connectivity (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The audio system may include the following components:

COMPONENT INDEX

1.	Refer to <u>ANTENNA MAST, BODY AND CABLE.</u>
2.	Refer to <u>SPEAKERS.</u>
3.	Refer to <u>RADIO.</u>
4.	Refer to <u>DIGITAL AUDIO BROADCAST ANTENNA AND MODULE.</u>
5.	Refer to <u>WIRELESS BLUETOOTH® SPEAKER.</u>
6.	Refer to <u>GLOBAL POSITIONING SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA.</u>
7.	Refer to <u>REAR VIEW CAMERA (RVC)</u> without Front View Camera (FVC).
8.	Refer to <u>REMOTE RADIO SWITCHES.</u>
9.	Refer to <u>MEDIA HUB.</u>
10.	Refer to <u>AMPLIFIER.</u>
11.	Refer to <u>BODY CONTROL MODULE (BCM).</u>

There are three radios, available in this vehicle, each equipped with a touchscreen display. There are four UconnectB® packages available; UconnectB® 3 with 5 inch display, UconnectB® 4 with 7 inch display, UconnectB® 4 NAV with 8.4 inch display, and UconnectB® 4C NAV with 8.4 inch display. Each radio has a distinct chassis design and is identified by a sales code.

With the optional navigation system, the operator has the option of choosing a street address, point of interest, trip itinerary and other features outlined in the operator's manual.

The audio system receives fused battery voltage from a fuse in the Power Distribution Center (PDC) at all times.

OPERATION

NOTE: The Security Gateway Module (SGW) is the Controller Area Network (CAN) gateway between the radio, telematics modules, Data Link Connector (DLC)

and the other vehicle CAN modules. An SGW failure could prevent the radio from powering up, telematics module from communicating or a scan tool from communicating with the vehicle. For additional information on the SGW. Refer to [MODULE, SECURITY GATEWAY \(SGW\), DESCRIPTION AND OPERATION](#) .

The audio system components are designed to provide audio entertainment and information through the reception, tuning and amplification of locally broadcast radio signals in both the Amplitude Modulating (AM) and Frequency Modulating (FM) commercial frequency ranges. If the vehicle is so equipped, the audio system can also receive, amplify or process certain cellular, satellite audio and satellite Global Positioning System (GPS) radio signals. The audio system components operate on battery current received through a fuse in the BCM.

The SGW is in the audio and telematics systems to provide security against certain types of attacks and threats from the scan tool, telematics and entertainment buses, which can put the rest of the vehicle's buses at risk of intrusion. The SGW lies electrically between the vehicle on one side, and the Data Link Connector (DLC), telematics and entertainment systems on the other side. The main function is to gate messages from one bus to another. The SGW monitors the B(+) Feed, switched ignition feed, CAN circuits, software and hardware for any concerns.

The optional navigation radio system receives GPS signals from up to eight satellites to display the position and direction of the vehicle. Map information is supplied through a DVD-ROM. An electronic gyro-sensor and the speed sensor in the vehicle enable the system to display the present vehicle position even in locations where GPS signals may be blocked. When a destination is selected, the navigation system uses information from the map to quickly calculate a route. As the vehicle is driven along the chosen route, the operator is guided with pictorial displays and voice prompts.

AMPLIFIER

Refer to [COMPONENT INDEX](#).

The audio power amplifier receives fused B(+) current from a fuse in the Power Distribution Center (PDC) and is grounded through a circuit of the body wire harness that is secured to the body sheet metal at all times. The internal circuitry of the amplifier switches the amplifier ON or OFF based upon electronic messages that are received over the CAN - Interior High Speed (CAN-IHS) data bus from the BCM whenever the ignition switch status is ON.

The amplifier receives analog sound signal inputs from the front and rear, left and right outputs of the radio, then provides the amplified speaker outputs for each of those channels to the appropriate speakers through dedicated audio output circuits. The amplifier also receives electronic messages from the Body Control Module (BCM) and the radio over the CAN-IHS data bus that communicate the correct channel settings for optimum speaker sound and output.

Hardwire Inputs

- Radio audio data
- Information 1 audio data
- Information 2 audio data

Hardwire Outputs

- Subwoofer output data
- Speaker output data

CAN-IHS Inputs

- Ignition switch status
- System voltage
- Vehicle speed

- Audio source, type and level controls
- Audio mode for cabin/driver
- Audio mute status
- Park assist chime type/request/rate and volume
- Blind Spot Module (BSM) chime type/request
- Forward Collision Warning (FCW) chime type/request/rate
- Vehicle configuration and status
- Radio configuration and status
- CAN configuration and status
- Removable hard top ON/OFF status from BCM

CAN-IHS Outputs

- Driver select surround status to radio
- Amplifier stored equalization curve to radio
- Surround sound available for selected cabin mode to radio

ANTENNA MAST, BODY AND CABLE

Refer to [COMPONENT INDEX](#).

The most visible component of the AM/FM radio antenna body and cable is the antenna mast, which is located on the right front fender. The antenna body and cable are secured to the inside of the fender by a nut through a prefabricated and dedicated mounting hole in the fender. The primary coaxial antenna cable is then routed to the interior of the vehicle to the right cowl side inner panel. The primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the right end of the instrument panel. The secondary coaxial cable is then routed behind the instrument panel to the back of the radio.

The factory-installed radio mast antenna consists of the following components:

- **Antenna body** - This is the mating structure between the antenna mast and the primary antenna coaxial cable. A threaded fitting on the top of the antenna body accepts the antenna mast, while a threaded fitting on the side of the antenna body is used to secure the antenna body to the right fender.
- **Antenna cable** - This vehicle uses a two-piece antenna coaxial cable. The primary antenna cable is connected to the antenna body and the secondary antenna cable connects the primary cable to the radio.
- **Antenna Mast** - The antenna mast is used to capture radio frequency signals that are broadcast by local commercial radio stations in both the Amplitude Modulating (AM) and Frequency Modulating (FM) frequency ranges. These electromagnetic radio frequency signals induce small electrical modulations into the antenna as they move past the mast. The antenna mast transfers the weak electromagnetic radio waves induced into it to the antenna body and cable.

The radio antenna body and cable connects the antenna mast to the radio. The radio antenna is an electromagnetic circuit component used to capture radio frequency signals that are broadcast by local commercial radio stations in both the Amplitude Modulating (AM) and Frequency Modulating (FM) frequency ranges. These electromagnetic radio frequency signals induce small electrical modulations into the antenna as they move past the mast.

The antenna body transfers the weak electromagnetic radio waves induced into the rigid antenna mast into the center conductor of the flexible primary antenna coaxial cable. The braided outer shield of the antenna coaxial cable is grounded through both the antenna body and the radio chassis, effectively shielding the radio waves as they are conducted to the radio. The radio then tunes and amplifies the weak radio signals into stronger electrical signals in order to operate the audio system speakers.

The radio antenna body and cable may be diagnosed using conventional diagnostic tools and procedures.

The components of the radio mast antenna cannot be adjusted or repaired. All factory-installed radios automatically compensate for radio antenna trim. Therefore, no antenna trimmer adjustment is required or possible after replacing the antenna mast, body and cable or the radio. If an antenna mast, body and cable component is damaged or ineffective, it must be replaced.

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

On vehicles that are equipped with the optional remote radio switches, the BCM receives the Local Interface Network (LIN) input as a digital serial signal from the Steering Column Control Module (SCCM). The remote radio switches on the steering wheel use various analog voltages to represent different states that are then from the left remote radio switch by LIN to the SCCM. The programming in the BCM allows it to process those inputs and send the appropriate electronic command messages to the radio receiver over the CAN-IHS data bus to control the radio volume up or down, station seek up or down, preset station advance, and mode advance functions.

CAN-IHS Outputs

- Ignition switch status
- System voltage
- Removable hard top ON/OFF status
- Remote radio switch requests

DIGITAL AUDIO BROADCAST ANTENNA AND MODULE

Refer to [COMPONENT INDEX](#).

Digital audio broadcast antenna is a digital radio standard for broadcasting digital audio radio services, used in many countries around the world, though not in North American countries. The antenna for digital audio broadcast signals is screened on the windshield and connects to the digital audio broadcast antenna module, which amplifies the digital audio broadcast antenna signals for the radio.

A digital audio broadcast antenna module and antenna are used in the countries that use it in place of an AM/FM antenna to receive digital audio broadcast signals.

The digital audio broadcast antenna module is powered by a 9 volt output from the radio through the coaxial cable whenever the radio receiver is active. The module receives digital audio broadcast Radio Frequency (RF) signals supplied by the on-glass digital audio broadcast antenna grid elements screened to the inside of the windshield glass. The capacitor selectively filters Radio Frequency Interference (RFI) from the received signals, while the module amplifies the received signals. The filtered and amplified signal is then sent through the coaxial cable to the radio digital audio broadcast antenna input.

The hardwired inputs and outputs to the antenna module may be diagnosed using conventional diagnostic tools and procedures. However, the module is diagnosed by substituting a known good external antenna to compare reception performance.

GLOBAL POSITIONING SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA

Refer to [COMPONENT INDEX](#).

If the vehicle is equipped with satellite audio, a combined antenna for satellite and navigation is used.

The audio system components are designed to provide audio entertainment and information through the reception, tuning and amplification of locally broadcast radio signal frequencies received. The system is also capable of receiving SDARS commercial frequency ranges by subscription.

MEDIA HUB

Refer to [COMPONENT INDEX](#).

A media hub allows the audio content of various media devices to be connected to the radio. Once connected, the audio content of the media device may be accessed and played through the audio system components of the vehicle using the radio controls.

The media hub monitors its circuits for excessive temperature and current conditions and will disable the media hub when a fault exists. The media hub will set a Diagnostic Trouble Code (DTC) in the radio when conditions exist for that DTC.

The media hub Universal Serial Bus (USB) ports provide 5 volts at 2.5 amps to charge the media device battery and for up to 60 minutes after the ignition switch is turned OFF. The hub will illuminate whenever a connected device is disconnected, indicating that the port(s) are active and ready to charge a device and incorporates the Apple Carplay and Google Android Auto features for the audio system.

NOTE: For diagnosis and testing of the media hub and USB ports, refer to the **MULTI-MEDIA TEST** in Refer to **MULTI-MEDIA TEST**.

RADIO

Refer to **COMPONENT INDEX**.

The radio becomes operational when it receives a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is ON or Accessory. For additional information on the operation of the radio or media system in the vehicle, see the heading for the appropriate audio system option in the User Guide or the Owner Manual. See the UconnectB® web site (<https://www.driveuconnect.com/>) for more information, or refer to the **For Owners** link on the vehicle brand web site for copies of those publications.

The Power Distribution Center (PDC) supplies fused B(+) to the radio.

The radio uses a fender mounted antenna for AM/FM signal reception and, depending upon vehicle optional equipment, a roof mounted combination antenna that can receive GPS and satellite radio signals.

Depending upon the audio system options, the radio can play audio from many different media sources. The media can be played by connecting the source to the audio system via a 3.5 millimeter auxiliary (AUX) port, a USB port or through wireless BluetoothB® audio streaming. Refer to the UconnectB® web site (<https://www.driveuconnect.com/>) for compatibility information.

NOTE: USB devices (for example, camera memory USB adaptors, USB drives and others, excluding Apple products) must comply with the Mass Storage Device (MSD) standard. This remote USB port can provide power to the inserted device.

Hardwire Inputs

- Integrated Center Stack (ICS) controls
- Steering wheel switch controls

Hardwire Outputs

- Radio audio data to amp
- Information 1 audio data to amp
- Information 2 audio data to amp

CAN-IHS Inputs

- Ignition switch status
- System voltage
- Vehicle speed
- Driver select surround status from amp

- Amplifier stored equalization curve from amp
- Surround sound available for selected cabin mode from amp
- Park assist chime type/request and volume
- BSM chime type/request
- FCW chime type/request/rate
- Removable hard top ON/OFF status from BCM
- Vehicle configuration and status
- Radio configuration and status
- CAN configuration and status

CAN-IHS Outputs

- Audio source, type and level controls
- Audio mode for cabin/driver
- Audio mute status

For additional information on the radio. Refer to [RADIO, DESCRIPTION AND OPERATION](#) .

REAR VIEW CAMERA (RVC)

Refer to [COMPONENT INDEX](#).

On models that are not equipped with a FVC, the RVC is powered by a ignition feed received through the backup lamp switch output circuit from the BCM so that is only active when the gear selector lever is shifted into the Reverse (**R**) position. The RVC has a path to ground at all times through a take out and eyelet terminal of the body wire harness secured to the body sheet metal. If the camera delay feature is enabled, the RVC will remain active for 10 seconds, up to about 13 km/h (8 mph) or until the touchscreen display is pressed after the gear selector is shifted from (**R**) to Neutral (**N**) or Drive (**D**).

The output of the camera is a digital video signal. The digital video signal is delivered to the radio video display unit through the entire length of the vehicle by camera signal and the camera return circuits that are arranged as a twisted pair, with an additional grounded foil jacket to protect the video signal from corruption due to stray radiated signals within the vehicle environment. The ground shield is terminated only at the video display (radio) end, not at the camera. Portions of these video signal wires are contained within the body wire harness and a jumper harness located between the radio and the body harness connector below the instrument panel at the right cowl side inner panel.

Refer to [COMPONENT INDEX](#).

REMOTE RADIO SWITCHES

Refer to [COMPONENT INDEX](#).

The six switches in the two remote radio switch units are normally open, resistor multiplexed momentary switches using various analog voltages to represent different states that are hardwired to the left steering wheel switch through the steering wheel wire harness and then switch position messages are sent via a LIN data bus to the Steering Column Control Module (SCCM). Once received, these messages are sent from the SCCM to the BCM via a LIN data bus. After the BCM receives the remote radio switch inputs, it then sends the appropriate electronic messages to the Instrument Panel Cluster (IPC) and radio over the CAN-IHS data bus to invoke the requested command.

SPEAKERS

Refer to [COMPONENT INDEX](#).

Two wires connected to each of the eight speakers and six wires in a single wire harness connector to the subwoofer (if equipped), one feed circuit (+) and one return circuit (-), allow the audio output signal electrical current from the amplifier information of the radio or directly from the amplifier (if equipped) to flow through

each speaker voice coil. When equipped with the optional Alpine Premium audio system, a subwoofer is also included.

NOTE: The subwoofer is located behind the rear center seat, secured to the subwoofer housing.

WIRELESS BLUETOOTHB® SPEAKER

Refer to [COMPONENT INDEX](#).

The wireless BluetoothB® speaker is a portable speaker that is capable of connecting with any BluetoothB® compliant device via BluetoothB® 4.0 or earlier protocol versions. The buttons on the top of the speaker turn the speaker ON/OFF, turn the volume UP/DOWN and are used to connect the speaker with a BluetoothB® device. Consult the Owner Information on the use of this device.

The speaker is charged by and stored in the docking station, and when connected with the docking station, it receives an audio signal from the amplifier which allows it to enhance the subwoofer capabilities of the premium sound system.

The USB port on the back of the speaker can be used for charging a device that is connected to the port. However, the port has no communication capability for media on the charging device.

The speaker is powered and charged when the ignition switch is in the RUN or Accessory position. Ground it provided at all times by a eyelet connect to the right C-pillar, near the seat cushion.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AUDIO

Any diagnosis of the Audio system should begin with duplicating the customer concern (verify the problem), include checking for applicable Technical Service Bulletins (TSB), Star Online Publications, software updates and the use of a diagnostic scan tool. Check for any Diagnostic Trouble Code (DTC) data. If a DTC is found, refer to - Radio and perform the appropriate diagnostic procedure before proceeding in this information. Refer to the appropriate wiring information.

Refer to the appropriate wiring information.

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

AUDIO SYSTEM DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
RADIO INOPERATIVE	1. Fuse inoperative	Check radio fuse. Check and repair cause of the inoperative fuse, then replace fuse as required.
	2. Open wiring	Check "No Response from ECU". Refer to NO RESPONSE FROM ECU .
	3. Security Gateway Module (SGW) inoperative	Check "Scan Tool Will Not Communicate With Vehicle". Refer to SCAN TOOL WILL NOT COMMUNICATE WITH VEHICLE .

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AUDIO - BUT RADIO LIGHTS UP	1. Antenna problem 2. Radio or Amplifier (if equipped) connector damaged 3. Wiring damaged 4. Radio or Amplifier (if equipped) ground damaged 5. Amplifier (if equipped) inoperative 6. Speakers inoperative	Perform the "Poor or No AM/FM Audio Reception" test. Refer to POOR OR NO AM/FM AUDIO RECEPTION . Check for loose or corroded radio/amplifier connector. Repair as required. Check for shorted or open wires. Repair wiring as required. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground as required. Refer to AMPLIFIER (AMP) - DIAGNOSTIC CODE INDEX . Refer to AUDIO (RADIO) - DIAGNOSTIC CODE INDEX .
NO RADIO DISPLAY	1. Fuse inoperative 2. Radio connector damaged 3. Wiring damaged 4. Radio ground circuit damaged 5. Radio inoperative	Check radio fuse. Check and repair cause of the inoperative fuse, then replace fuse as required. Check for loose or corroded radio connector. Repair as required. Check for battery voltage at radio connector. Repair wiring as required. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground as required. Check "No Response from ECU". Refer to NO RESPONSE FROM ECU .
POOR AM/FM RADIO RECEPTION	1. Antenna inoperative 2. Radio ground damaged 3. Radio inoperative	Perform the "Poor or No AM/FM Audio Reception" test. Refer to POOR OR NO AM/FM AUDIO RECEPTION . Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground as required. Refer to NO RESPONSE FROM ECU or check "No Response from ECU". Refer to DIAGNOSIS AND TESTING .
POOR SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) AUDIO RECEPTION	1. SDARS antenna inoperative	Perform the "Poor or No Satellite Audio Reception" test. Refer to NO RESPONSE FROM ECU
SOUND DISTORTION (VIBRATION FROM SPEAKER AREA, BUZZING - HUMMING)	1. Door trim panel loose or missing fasteners 2. Water shield loose or misaligned 3. Items placed in door trim panel map pockets vibrating or moving from side to side	Inspect door trim panel and correct as necessary. Replace any missing fasteners. Inspect watershield and adjust as required. Remove items from door trim panel. Make certain that vibration is no longer present.

TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	COMMENT
Antenna Base to Right Outer Cowl Panel	5	-	44	B

ANTENNA, SATELLITE, AUDIO

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - SATELLITE ANTENNA

For information on diagnosing the Satellite Digital Audio Radio Services (SDARS) antenna, use the **POOR OR NO SATELLITE AUDIO RECEPTION** test. Refer to [POOR OR NO AM/FM AUDIO RECEPTION](#) .

For information on diagnosing the Global Positioning System (GPS) satellite navigation system, use the **POOR OR NO GPS RECEPTION** test. Refer to [POOR OR NO GPS RECEPTION](#) .

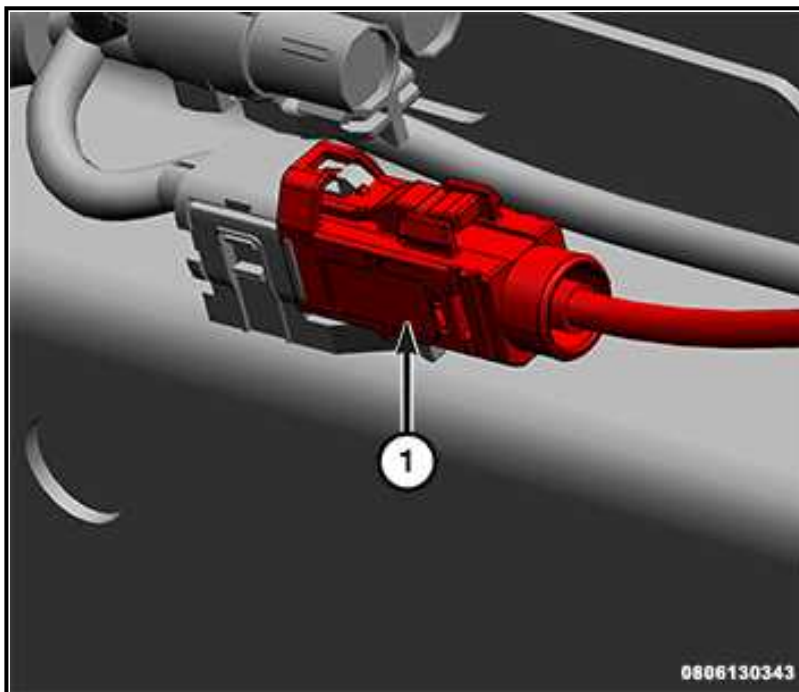
For information on diagnosing the satellite antenna cables using the (special tool #9977-6, Kit, Radio Antenna Diagnostic), and perform the. Refer to [POOR OR NO SATELLITE AUDIO RECEPTION](#) .**POOR OR NO SATELLITE AUDIO RECEPTION** test.

REMOVAL AND INSTALLATION

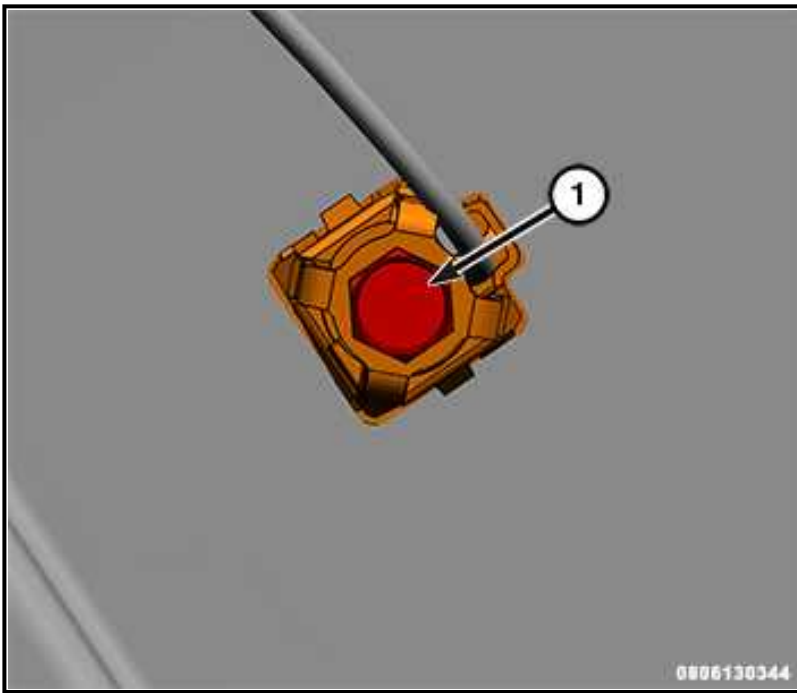
REMOVAL AND INSTALLATION

REMOVAL

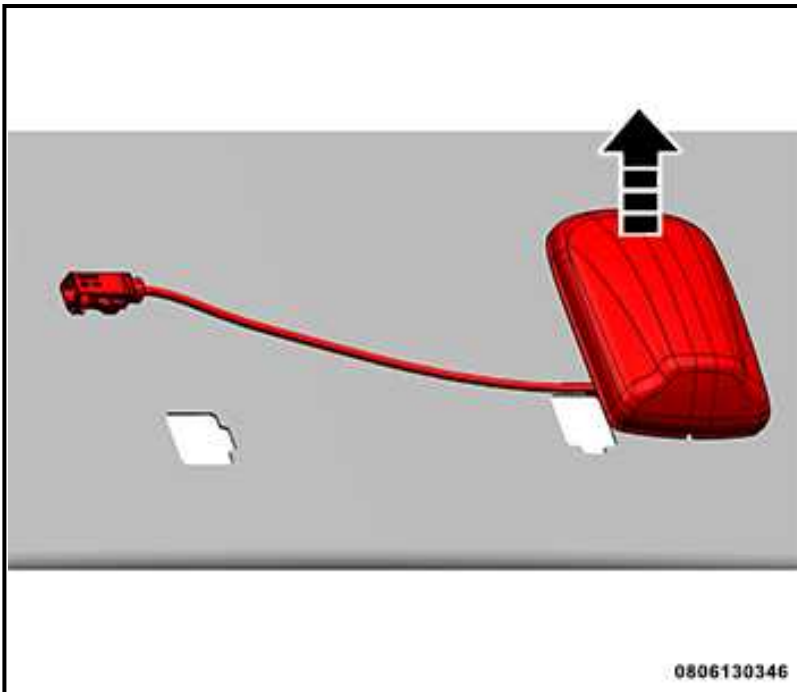
1. Disconnect and isolate the negative battery cable(s) Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the sport bar speaker pod assembly Refer to [BAR, SPORT, SPEAKER POD, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (1).



4. Remove the antenna mounting retainer (1).



5. From inside the vehicle, using a flat bladed tool, press one of the two plastic retaining tabs on the antenna stud. Push up on one side of the antenna stud, press the other plastic retaining tab and remove the antenna from the sport bar.

INSTALLATION

NOTE: A new silver clip (with four legs) must be used if the same antenna is being re-installed.

1. Insert the wire harness through the hole in sport bar. Press the antenna into position until both retainers on the antenna stud and the locator stud engage into position in the sport bar.
2. Install the antenna mounting fastener and tighten securely.
3. Connect the antenna connector.
4. Install the sport bar speaker pod assembly Refer to [BAR, SPORT, SPEAKER POD, REMOVAL AND INSTALLATION](#) .

5. Connect the negative battery cable(s) Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

BODY AND CABLE, ANTENNA

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ANTENNA BODY AND CABLE

The following four tests are used to diagnose the antenna with an ohmmeter:

- **TEST 1** - Mast to ground test
- **TEST 2** - Tip-of-mast to tip-of-conductor test
- **TEST 3** - Body ground to battery ground test
- **TEST 4** - Body ground to antenna coaxial cable shield test.

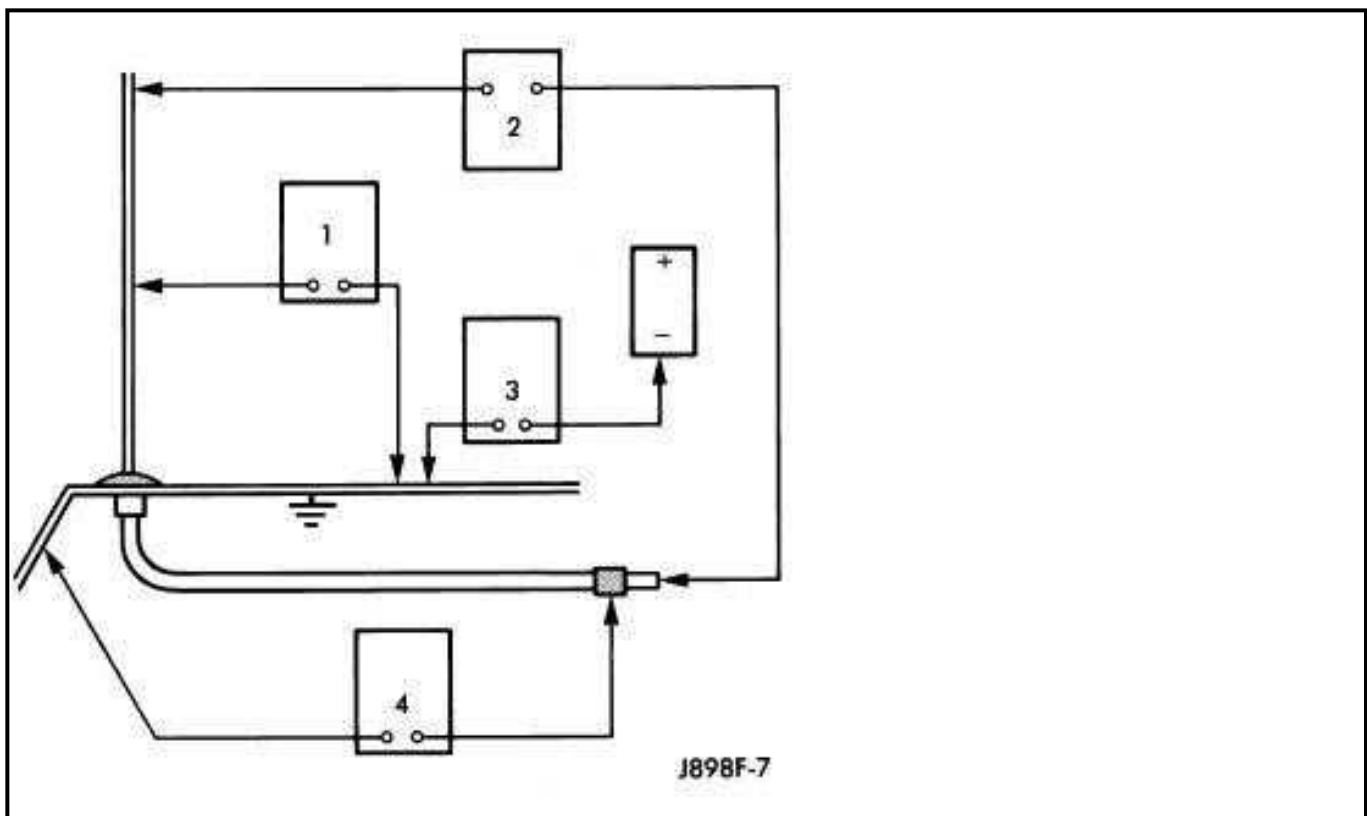
WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The ohmmeter test lead connections for each test are shown in the illustration.

NOTE:

This vehicle has a two-piece radio antenna coaxial cable. Tests 2 and 4 must be conducted in two steps to isolate an antenna cable problem. First, test the primary antenna cable (located between the antenna body and the secondary cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the antenna body. Then, test the secondary antenna cable (instrument panel antenna cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the coaxial cable connector at the radio.



TEST 1

- Test 1 determines if the antenna mast is insulated from ground. Proceed as follows:

1. Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.
2. Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the antenna body. Check the ohmmeter reading for continuity.
3. There should be no continuity. If OK, go to **Test 2** . If not OK, replace the shorted antenna body and cable.

TEST 2

- Test 2 checks the antenna conductor components for an open circuit. This test should be performed first on the entire antenna circuit, from the antenna mast to the center conductor of the coaxial cable connector at the radio. If an open circuit is detected, each of the three antenna conductor components (antenna mast, antenna body and primary cable unit, instrument panel antenna secondary cable) should be isolated and tested individually to locate the exact component that is the source of the open circuit. To begin this test, proceed as follows:

1. Disconnect the instrument panel (secondary) antenna cable coaxial connector from the back of the radio.
2. Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the center conductor pin of the instrument panel antenna cable coaxial connector for the radio. Check the ohmmeter reading for continuity.
3. There should be continuity. The ohmmeter should register only a fraction of an ohm resistance. High or infinite resistance indicates a damaged or open antenna conductor. If OK, go to **Test 3** . If not OK, isolate and test each of the individual antenna conductor components. Replace only the ineffective antenna conductor component.

TEST 3

- Test 3 checks the condition of the vehicle body ground connection. To begin this test, proceed as follows:

1. This test must be performed with the battery positive cable disconnected from the battery. Disconnect and isolate both battery cables, negative cable first.

2. Reconnect the battery negative cable.
3. Touch one ohmmeter test lead to a good clean ground point on the vehicle right fender panel. Touch the other test lead to the battery negative terminal post. Check the ohmmeter reading for continuity.
4. There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded or damaged connection between the battery negative terminal and the vehicle body. If OK, go to **Test 4** . If not OK, check the battery negative cable connection to the vehicle body and the radio noise suppression ground strap connections to the engine and the vehicle body for being loose or corroded. Clean or tighten these connections as required.

TEST 4

- Test 4 checks the condition of the connection between the antenna coaxial cable shield and the vehicle body ground as follows:

1. Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.
2. Touch one ohmmeter test lead to a good clean ground point on the vehicle right fender panel. Touch the other test lead to the outer crimp on the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel. Check the ohmmeter reading for continuity.
3. There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded or damaged connection between the antenna body and the vehicle body or between the antenna body and the antenna coaxial cable shield. If not OK, clean the antenna body to right fender panel mating surfaces and tighten the antenna mounting nut to specifications.
4. Check the resistance again with an ohmmeter. If the resistance is still more than one ohm, replace the ineffective antenna body and cable.

For additional diagnosis of an AM/FM reception issue, perform the **POOR OR NO AM/FM AUDIO RECEPTION** test. Refer to [POOR OR NO AM/FM AUDIO RECEPTION](#) .

REMOVAL AND INSTALLATION

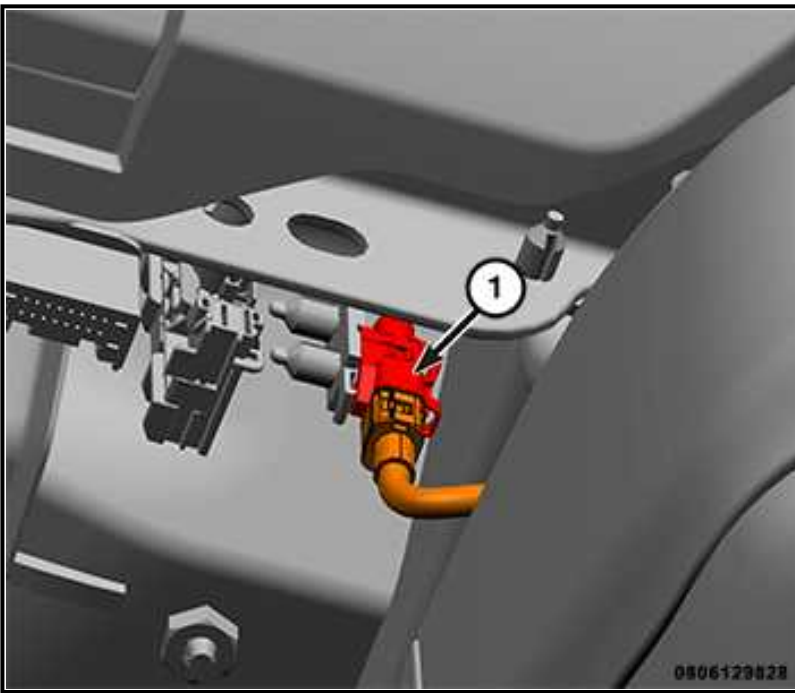
REMOVAL AND INSTALLATION

REMOVAL

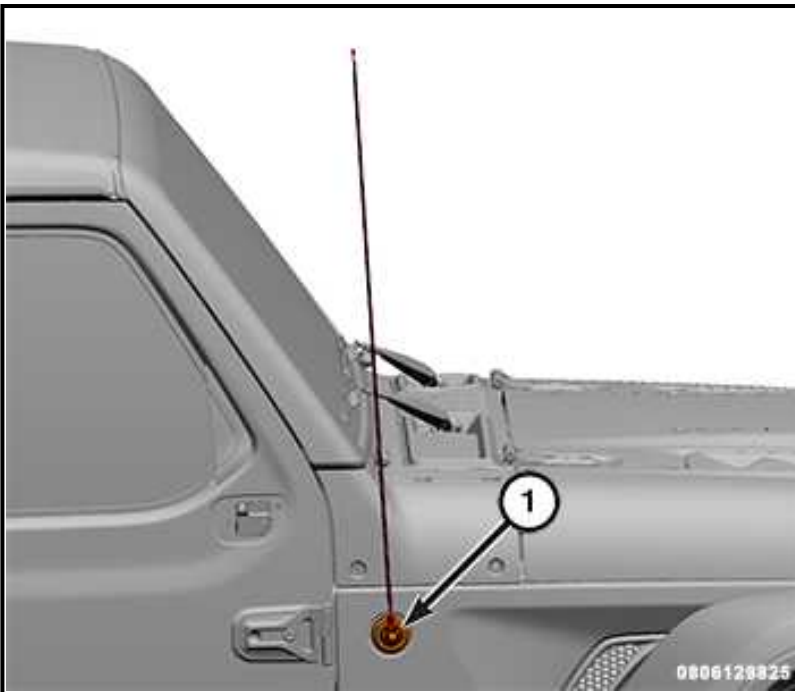
WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

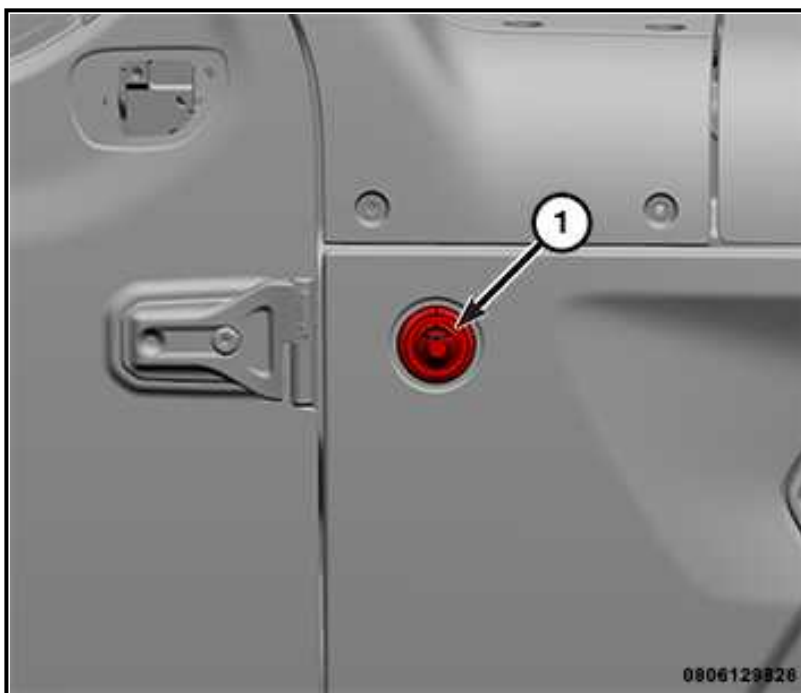
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the glove box from the instrument panel. Refer to [GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .



3. Reach through the instrument panel glove box opening to unplug the antenna coaxial cable connector (1).



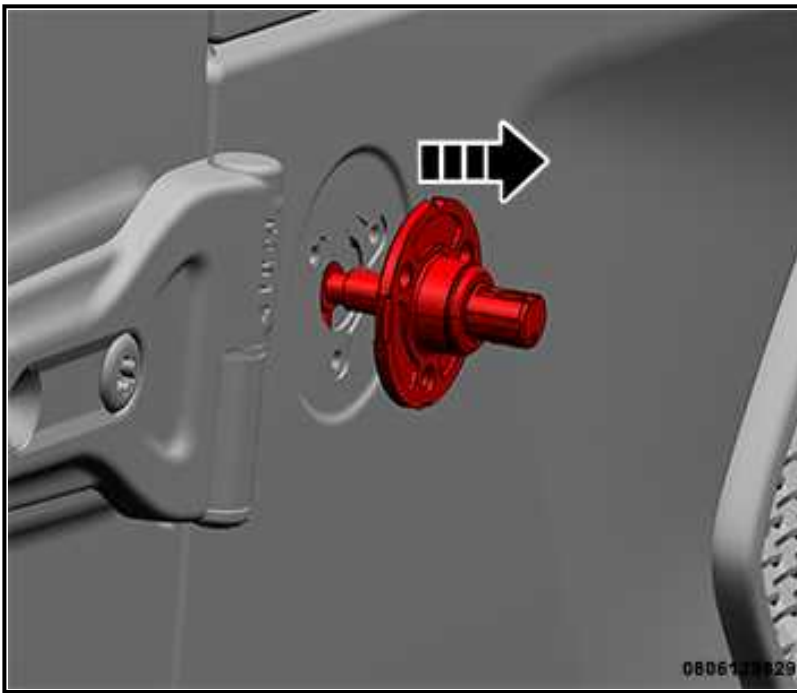
4. Unscrew the antenna mast from the antenna body base (1) on the right outer cowl side panel.



5. Using a trim stick C-4755 or equivalent, gently pry the edge of the antenna base trim cover (1) to unsnap it from the antenna body base.



6. Remove the fasteners (1) that secure the antenna body base to the right outer cowl side panel.



7. From inside the passenger compartment, push the coaxial cable grommet on the antenna body half of the coaxial cable out through the hole in the right inner cowl side panel.
8. From the outside of the vehicle, pull the antenna body base and cable assembly out through the hole in the right outer cowl side panel.

INSTALLATION

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. From outside the vehicle, feed the antenna cable and base assembly through the outer cowl side panel and into the inner cowl side panel hole.
2. From inside the passenger compartment, pull the cable and grommet into the hole in the inside cowl side panel until the grommet is fully seated.
3. Install the fasteners retaining the antenna body base to right outer cowl side panel. Tighten the fasteners to the proper specifications. Refer to [TORQUE SPECIFICATIONS](#).
4. Snap on the antenna base trim cover to the antenna body base.
5. Install antenna mast. Tighten securely.

NOTE: Make certain that the antenna mast is fully seated on antenna base and that there is no gap between the mast and base.

6. Reach through the glove box opening and connect the antenna coaxial cable inline connector.
7. Install the glove box to the instrument panel. Refer to [GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).
8. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).

CAMERA, REAR

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - REAR CAMERA

The hardwired circuits of the Rear View Camera (RVC) and those between the RVC and the radio may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . Refer to [REMOVAL](#) , and Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the RVC or the radio. The most reliable, efficient and accurate means to diagnose the electronic controls and communication related to radio operation, as well as the retrieval or erasure of a Diagnostic Trouble Code (DTC) requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Be certain to confirm the following prior to attempting any additional diagnosis or testing of the RVC. Use a diagnostic scan tool to confirm the rear view camera is setup in the vehicle configuration.

NOTE: Be certain the radio has been configured with the latest software. Many radio issues can be resolved by updating the radio to the latest software.

NOTE: For additional information on diagnosing issues with the RVC, see "DIAGNOSIS AND TESTING REAR CAMERA INOPERATIVE WITH RADIO DISPLAY" test. Refer to [DIAGNOSIS AND TESTING REAR CAMERA INOPERATIVE WITH RADIO DISPLAY](#) .

NOTE: Prior to starting rear view camera diagnostics, the following step must be performed: With the scan tool, perform the Reset ECU function for the Radio under the Guided Diagnostics menu in the scan tool.

NOTE: When utilizing RG-174 Coax Cable Adapter 9977-6-8 OR a known good camera, the following step must be adhered to prior to checking camera functionality: With the scan tool, perform the Reset ECU function for the Radio under the Guided Diagnostics menu in the scan tool.

REAR VIEW CAMERA DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
VIDEO IMAGE IS BLURRY OR OBSTRUCTIVE	1. Dirt, smear, fingerprints on RVC lens.	1. Inspect lens for foreign material, and clean lens as required, using the lens cleaning procedure.
	2. Ineffective camera shield circuit in the Low Voltage Differential	7. Inspect the LVDS coaxial cable for damage to the terminals. Check RVC coaxial connection

REAR VIEW CAMERA DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
	Signal (LVDS) coaxial cable connection at the Radio or RVC	using . Replace as necessary. For additional diagnosis of the RVC, refer to the "Diagnosis And Testing Camera Inoperative With Display Screen" test. Refer to the appropriate information.
	3. Moisture buildup on the inside of the lens	3. Replace the ineffective camera as required.
NO VIDEO DISPLAY IN RADIO AND DOES NOT DISPLAY ANY MESSAGE	1. Incorrect radio software	1. Check to be certain that the radio has the latest software update installed. Install the radio software update, if required.
	2. Ineffective radio inputs or outputs	2. Use a diagnostic scan tool to test the radio inputs and outputs including those received over the Controller Area Network (CAN) data bus. Refer to the appropriate diagnostic information.
	3. Ineffective radio	3. Use a diagnostic scan tool to test the radio. Refer to the appropriate diagnostic information.
	4. Ineffective radio fuse	4. Test and replace the radio fuses, if required.
	5. Ineffective radio ground circuit	5. Check for loose or damaged wiring connections at the radio. Test and repair the open radio ground circuit, if required.
	6. Ineffective radio feed circuit	6. Check for loose or damaged wiring connections at the radio. Test and repair the open radio feed circuit, if required.
	7. Ineffective LVDS coaxial connection at RVC or LVDS cable	7. Check the LVDS coaxial cable center terminal for 10 volts (VP2R radios) or 12 volts (VP4R radios). Check RVC LVDS coaxial connection using . Replace as necessary. For additional diagnosis of the RVC, refer to the "Diagnosis And Testing Camera Inoperative With Display Screen" test. Refer to the appropriate information.
CAMERA IMAGE BUT NO GRIDLINES	1. Setting disabled in Radio	1. Check setting in radio to ensure active guideline is enabled.
	2. Incorrect radio software	2. Check to be certain that the radio has the latest software update installed. Install the radio software update, if required.
	3. Ineffective Radio	3. Use a diagnostic scan tool to test the radio. Refer to the appropriate diagnostic information.

REAR VIEW CAMERA DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
	4. Incorrect Body Control Module (BCM) software	4. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
	5. Ineffective camera LVDS circuit	5. Check for loose or damaged wiring connections between the camera and the radio. Refer to the appropriate diagnostic information. Replace the section of harness that is damaged, if required.
NO CAMERA IMAGE IN RADIO VIDEO DISPLAY AND NO BACKUP LAMPS IN REVERSE	6. Ineffective camera	6. Replace camera.
	1. Backup lamps inoperative. 2. Both backup lamps inoperative. 3. Ineffective BCM inputs or outputs.	1. Test and repair the open backup lamp switch output circuit between the right and left tail lamps if required. 2. Test and repair the open backup lamp switch output circuit between the Body Control Module (BCM) and the tail lamps, if required. 3. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
NO CAMERA IMAGE IN RADIO VIDEO DISPLAY - DOES DISPLAY CHECK ENTIRE SURROUNDINGS MESSAGE BRIEFLY AFTER SHIFTING INTO REVERSE AND BACKUP LAMPS DO OPERATE	1. Ineffective camera LVDS coaxial circuit or shield circuit 6. Ineffective camera.	1. Check the LVDS coaxial cable center terminal for 10 volts (VP2R radios) or 12 volts (VP4R radios). Check for loose or damaged wiring connections between the camera and the radio. Refer to the appropriate diagnostic information. Replace the LVDS cable, if required. 6. Replace the ineffective camera, if required.

CLEANING

NOTE: The use of nylon gloves will prevent oil and debris on your hands from being transferred to the camera body or lens surface. While wearing the gloves, care should be taken not to contact exposed body parts such as the forehead, nose and arms. If contact is made accidentally, gloves should be changed to mitigate the risk of contaminant transfer from the surface of the gloves.

1. Using compressed air, blow diagonally across the camera lens.
2. Use a microfiber lens tissue to gently wipe the lens.
3. Examine the lens to verify the cleaning process. Proceed to **Step 4** if the lens still shows signs of oil or debris.
4. Apply a lens cleaning solution to a section of an unused lens tissue.
5. Slowly wipe in a circular motion around the edges of the lens to remove any dirt or contamination from the periphery of the lens before cleaning the center.
6. Let the lens air dry.

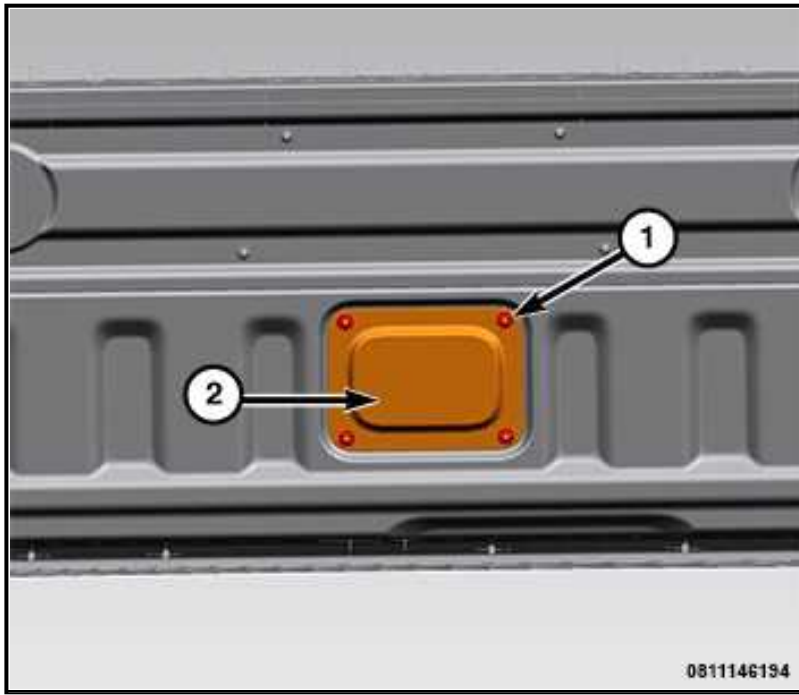
7. Examine the lens to verify the cleaning process.

REMOVAL AND INSTALLATION

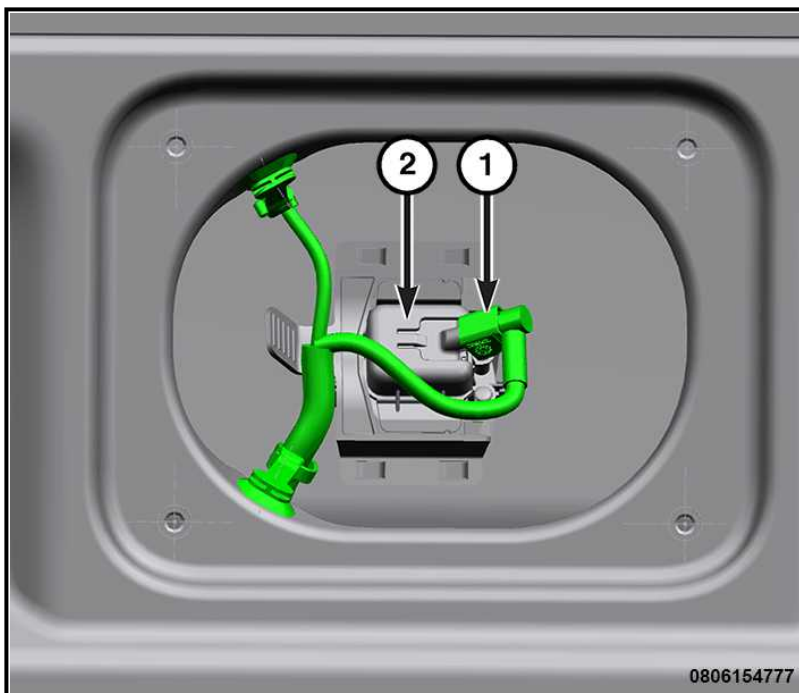
REMOVAL AND INSTALLATION

REMOVAL

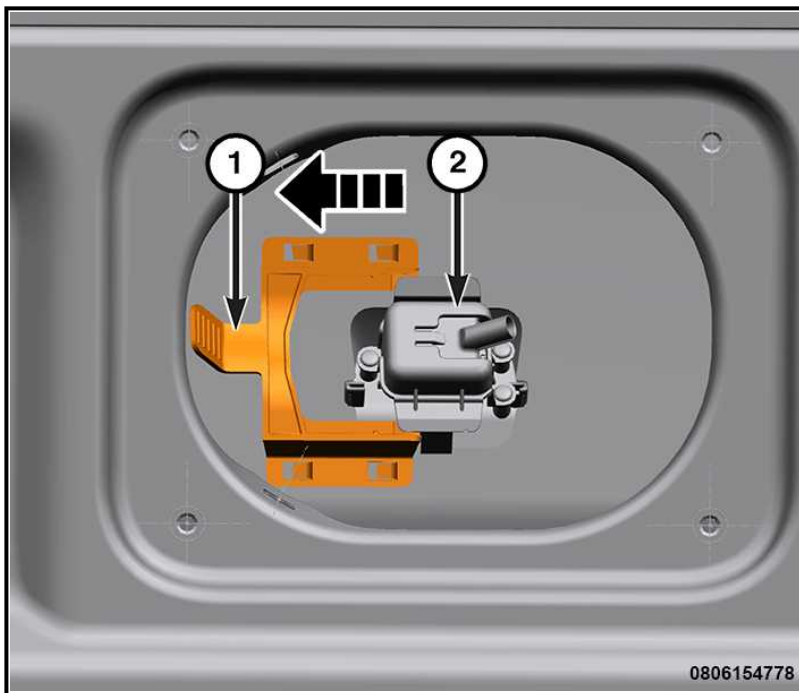
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .



2. Remove the four fasteners (1) that secure the rear tailgate lower access panel.
3. Remove the lower access panel (2).

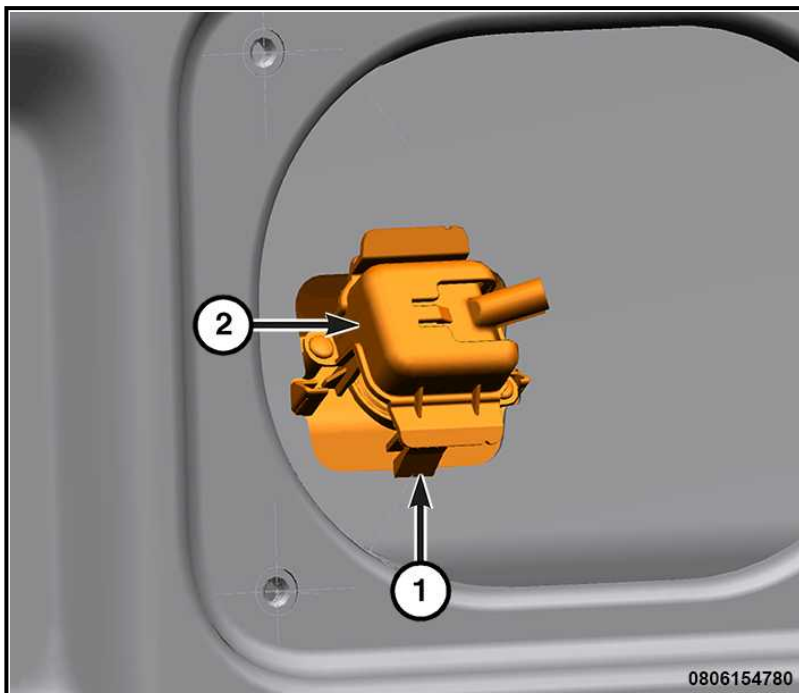


4. Disconnect the wire harness connector (1) from the back of the rear camera (2).

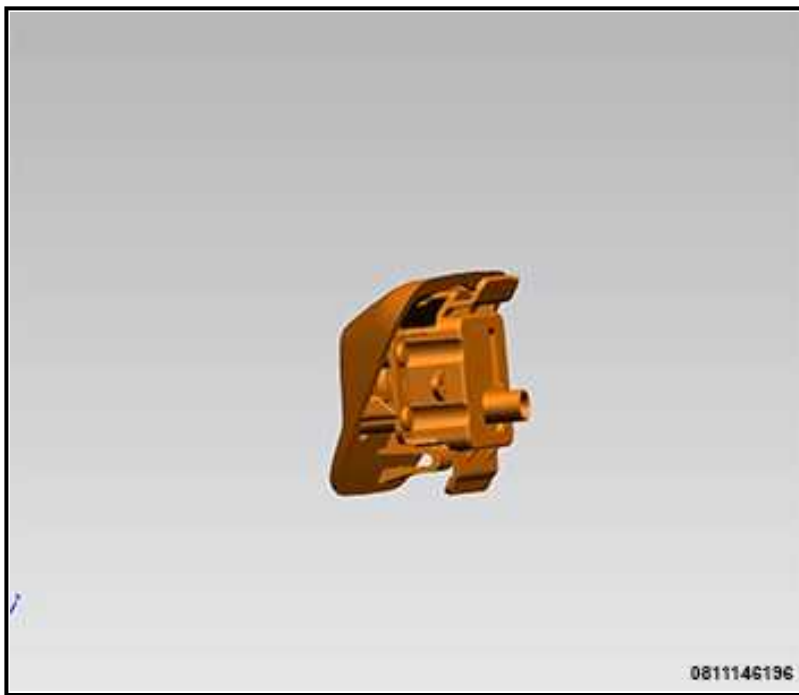


5. Grab handle of the rear camera retaining clip (1) and slide it away from the camera to release.

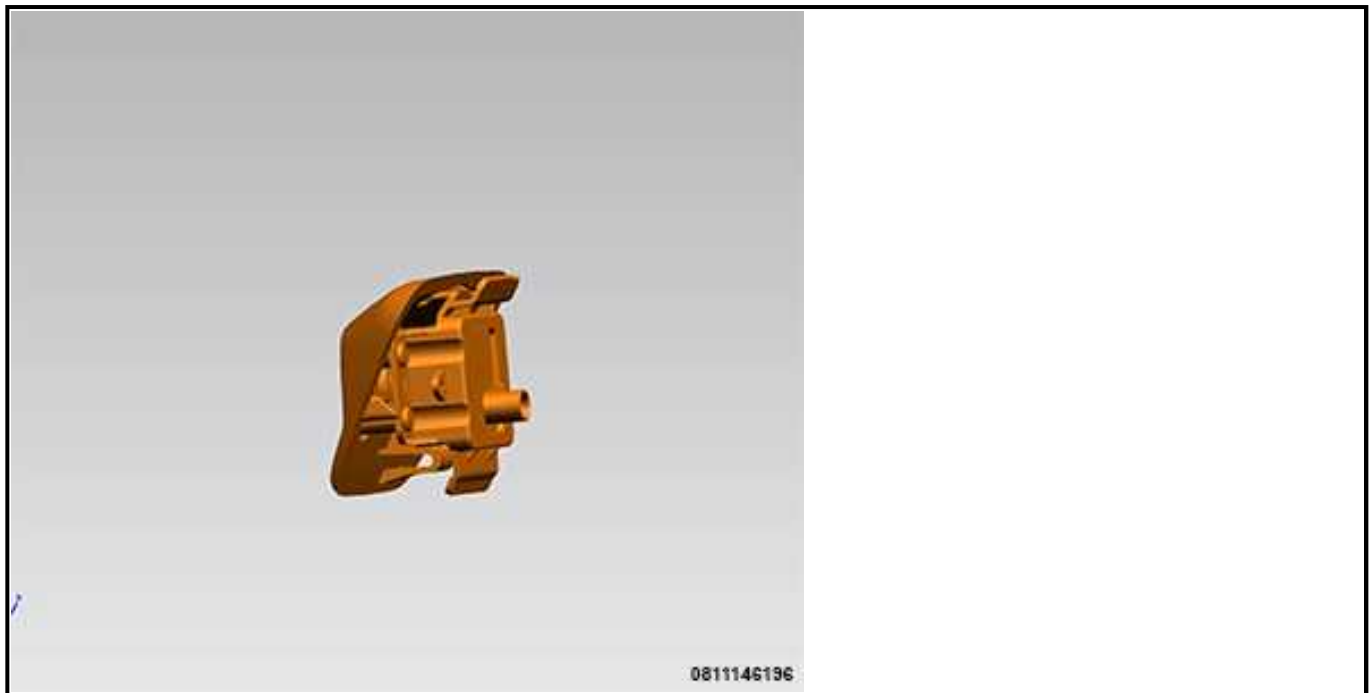
NOTE: The camera must be secured during the next step to keep camera from falling when released from tailgate.



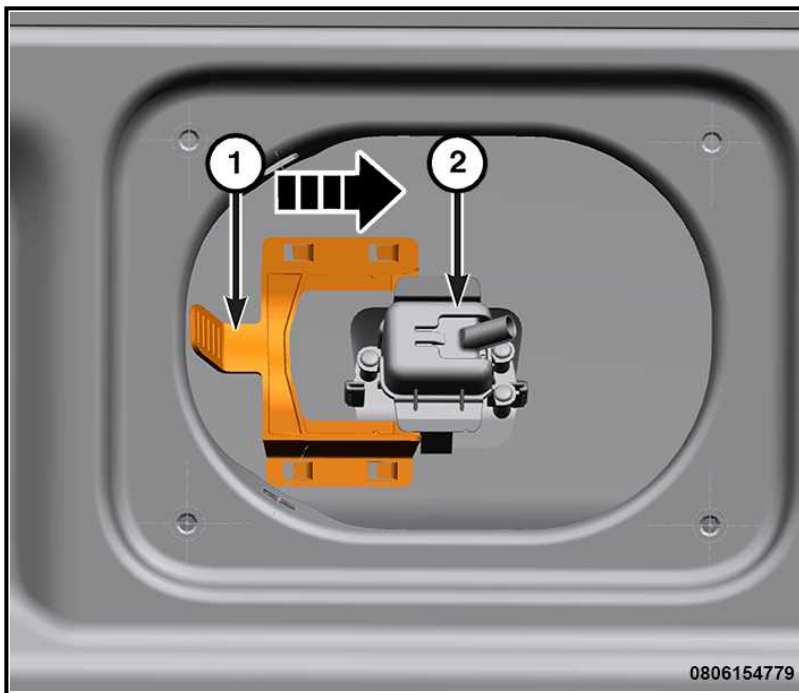
6. Using a small flat blade screwdriver or equivalent, push up to release lower retainer (1), then slide camera (2) down and out to release top retainer. Remove camera from the front of the tailgate.



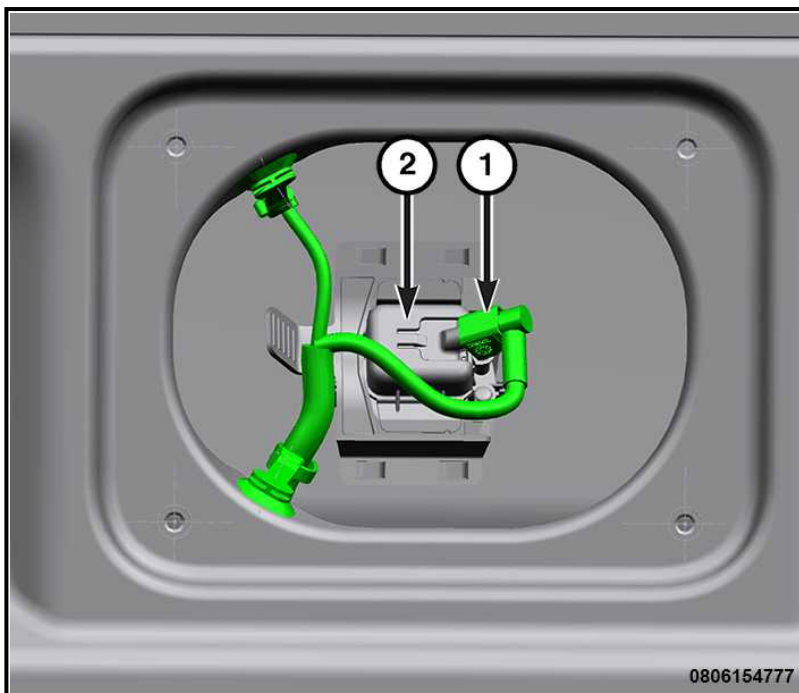
INSTALLATION



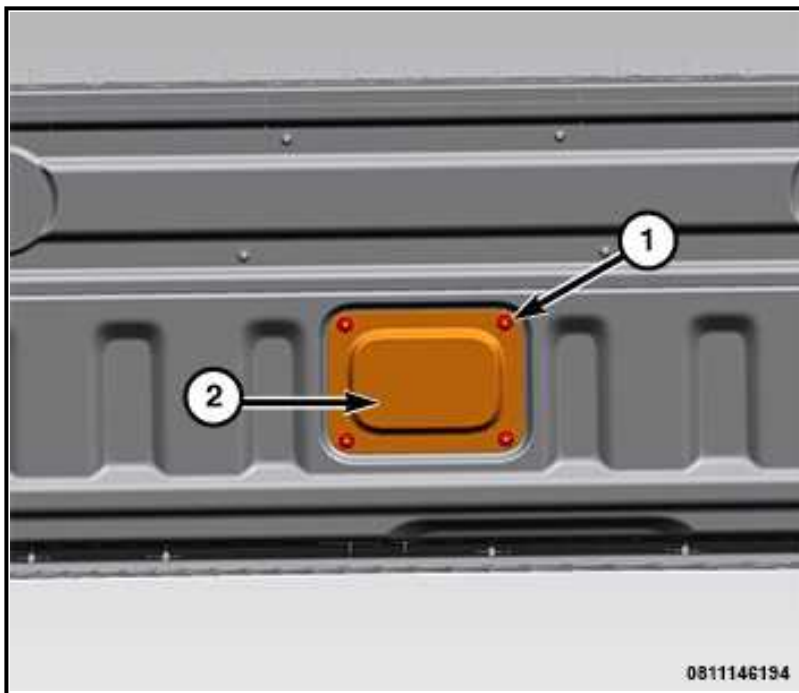
1. Position the rear view camera into the tailgate, insert top in first then lower. Be sure tabs are fully seated in the tailgate.



2. Install the rear camera retainer (1) under the tabs on the rear camera (2) and slide it towards the camera until it locks into place.



3. Connect the wire harness connector (1) to back of the rear camera (2).



4. Position the lower tailgate access plate (2) on the tailgate and install the four fasteners (1) and tighten securely.

ENCLOSURE, SPEAKER

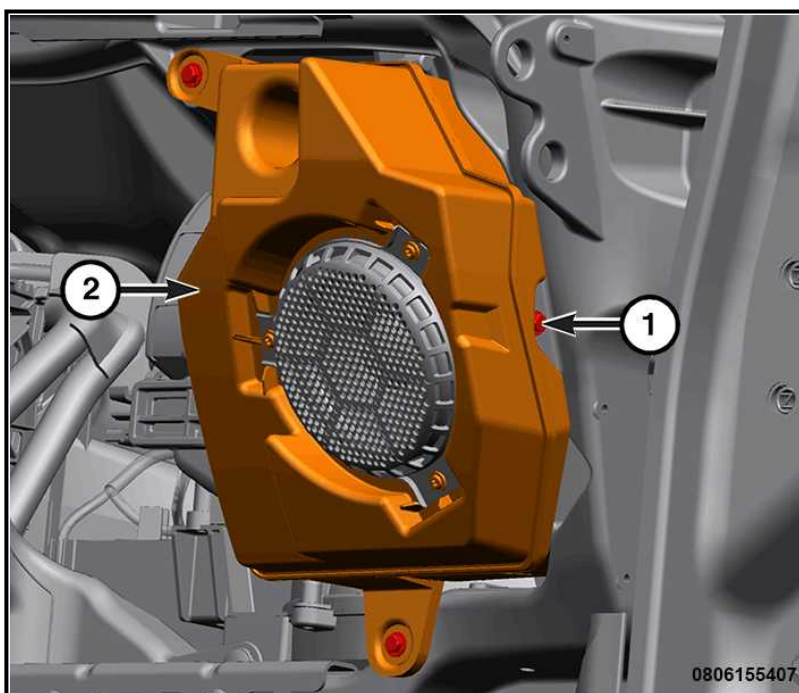
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

PASSENGER SIDE

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the passenger side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .

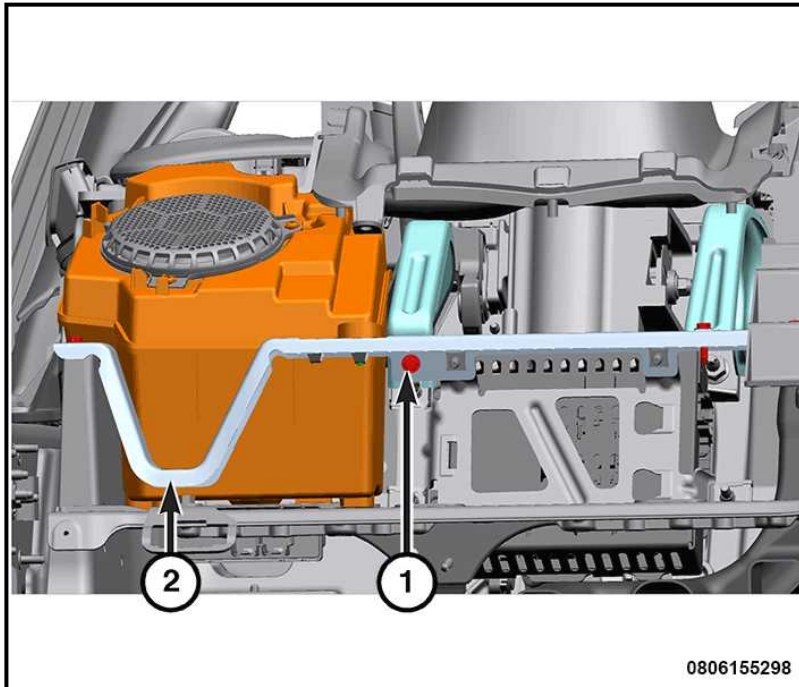


3. Remove the fasteners (1).

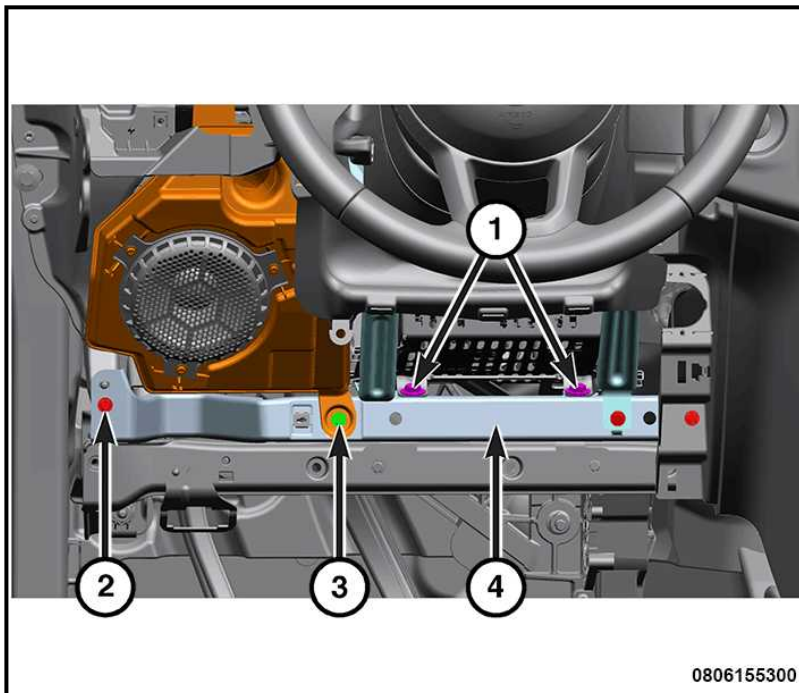
4. Disconnect the wire harness connector and remove the passenger side speaker enclosure (2).

DRIVER SIDE

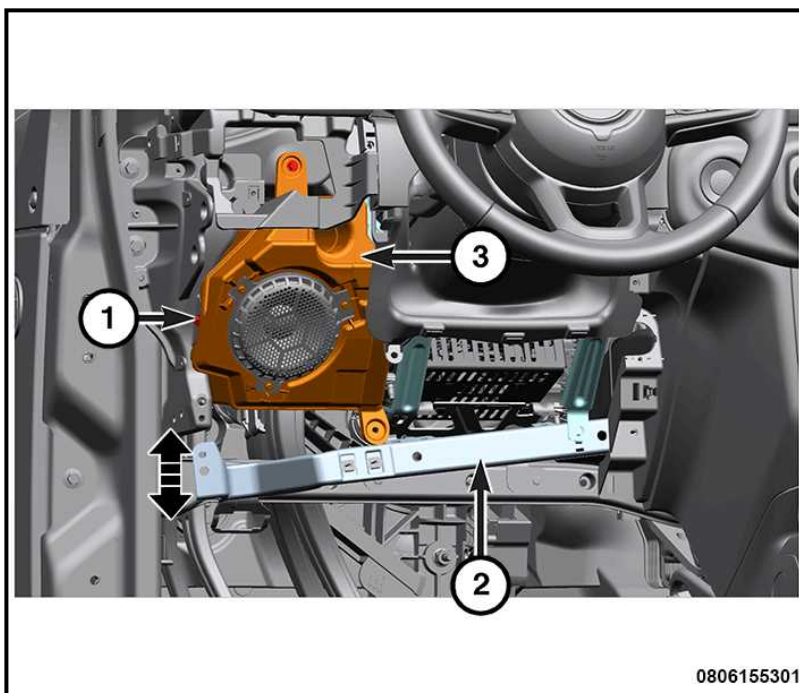
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the driver side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .



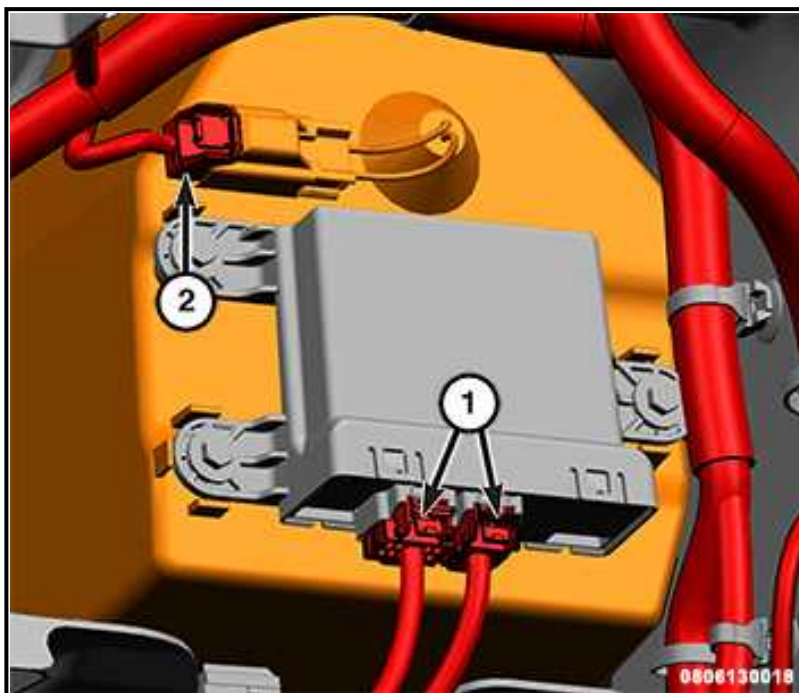
3. From the bottom of the driver side of the instrument panel (I/P), remove the fastener (1) that secures the horizontal I/P bracket (2) to the left vertical brace.



4. Remove the fasteners (1) from the power inverter bracket.
5. Remove the lower fastener (3) from the driver side speaker enclosure.
6. Remove the fasteners (2) from the horizontal I/P bracket.



7. Position the horizontal I/P bracket (2) downward to retain enough access for the speaker enclosure removal.
8. Remove the fasteners (1) to release the speaker enclosure (3).
9. Slide speaker enclosure (3) down and then out from the I/P.

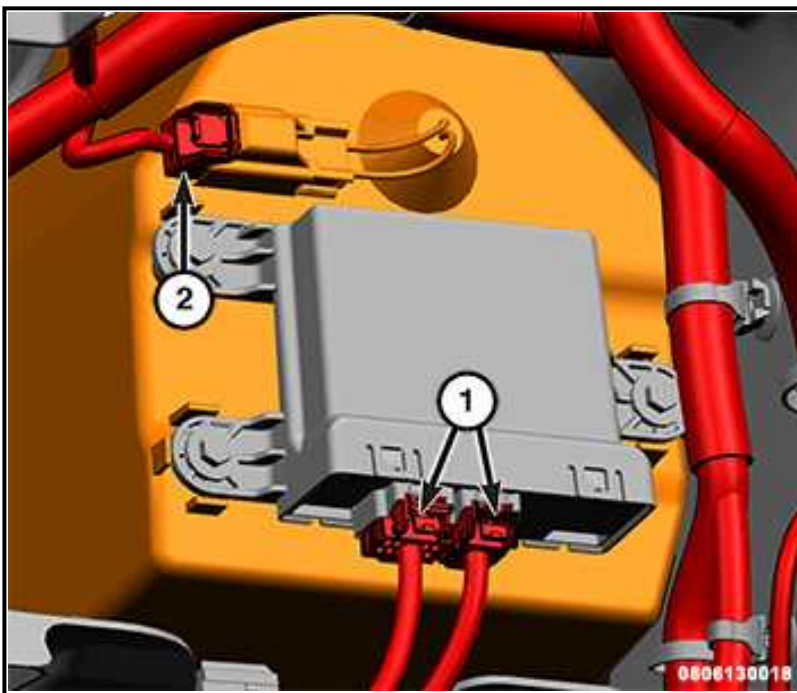


10. Disconnect the two Security Gateway Module (SGW) wire harness connectors (1) and the speaker enclosure wire harness connector (2). Remove the left speaker enclosure from the vehicle.

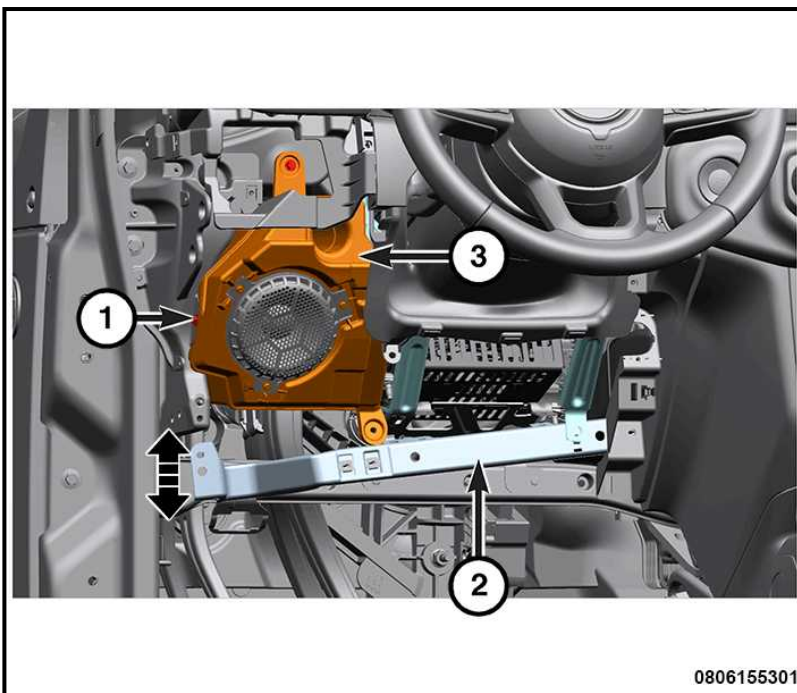
INSTALLATION

DRIVER SIDE

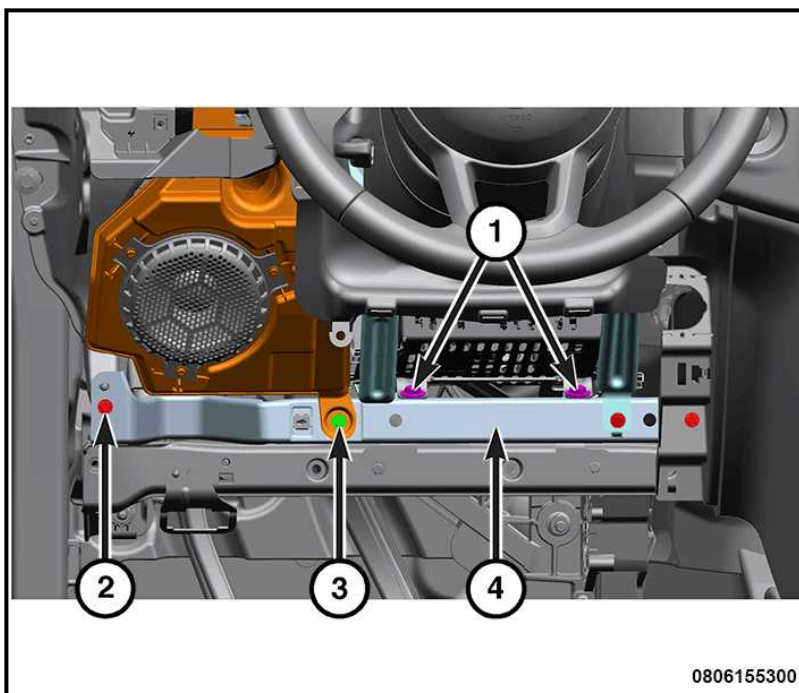
1. If removed, position the SGW to the speaker enclosure, then install the fasteners and tighten them securely.



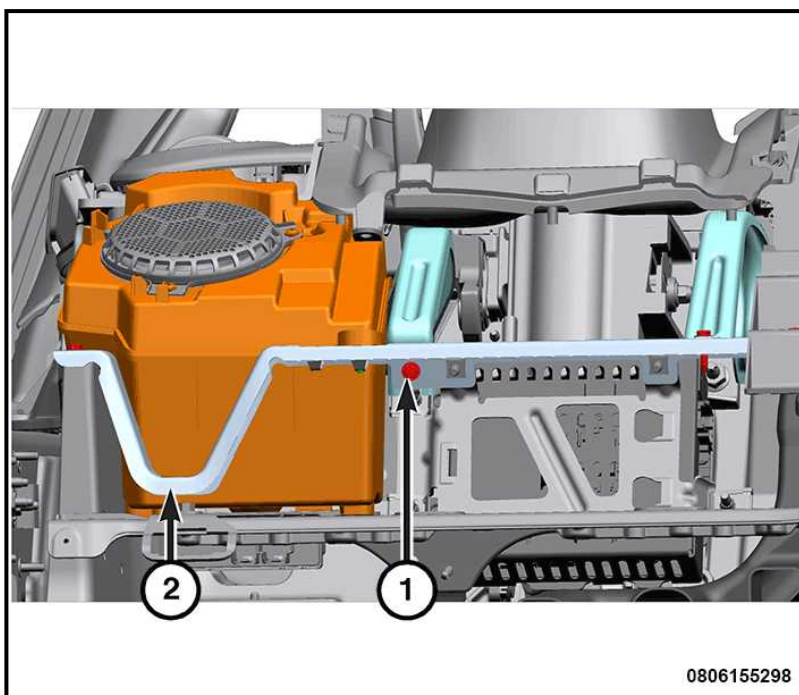
2. Connect the two SGW wire harness connectors (1) and the speaker enclosure wire harness connector (2).



3. Position the driver side speaker enclosure (3) into the instrument panel.
4. Install the fasteners (1) that retain the driver side speaker enclosure and tighten them securely.
5. Position the horizontal bracket to the instrument panel reinforcement beam.

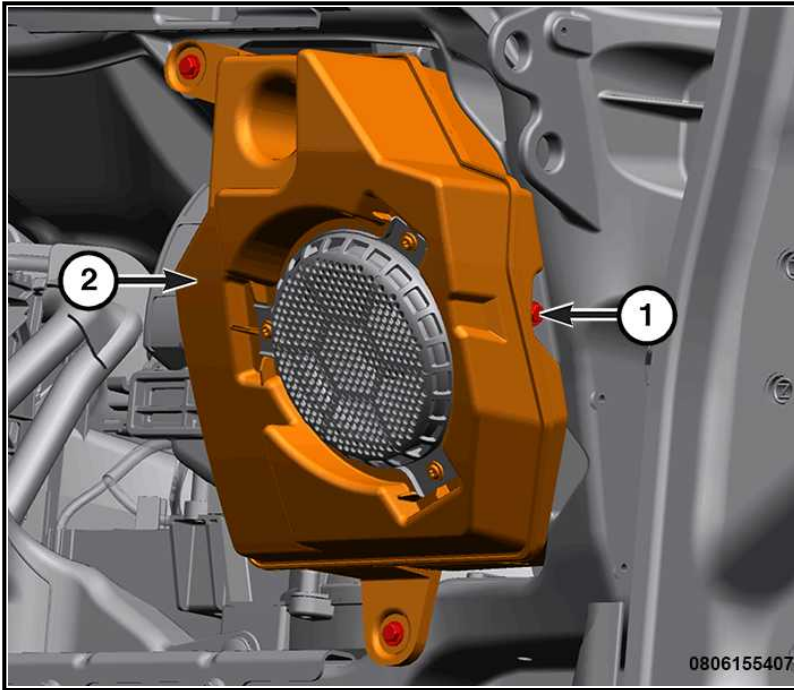


6. Install the fasteners (2) for the horizontal instrument panel bracket and tighten them securely.
7. Install the lower fastener (3) for the driver side speaker enclosure and tighten it securely.
8. Install the fasteners (1) for the power inverter bracket and tighten them securely.



9. From the bottom of the driver side of the instrument panel, install the fastener (1) that secures the horizontal instrument panel bracket (2) to the left vertical brace and tighten it securely.
10. Install the driver side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .
11. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

PASSENGER SIDE



1. Position the passenger side speaker enclosure to the instrument panel and connect the wire harness connector.
2. Install the fasteners (1) that retain the passenger speaker enclosure (2) and tighten them securely.
3. Install the passenger side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).
4. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).

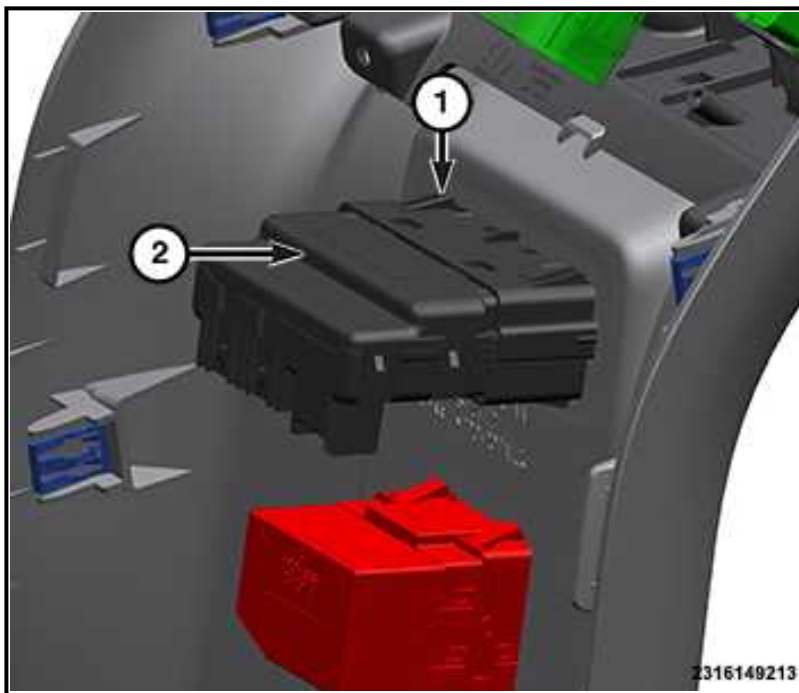
MEDIA HUB

REMOVAL AND INSTALLATION

FLOOR CONSOLE MEDIA HUB

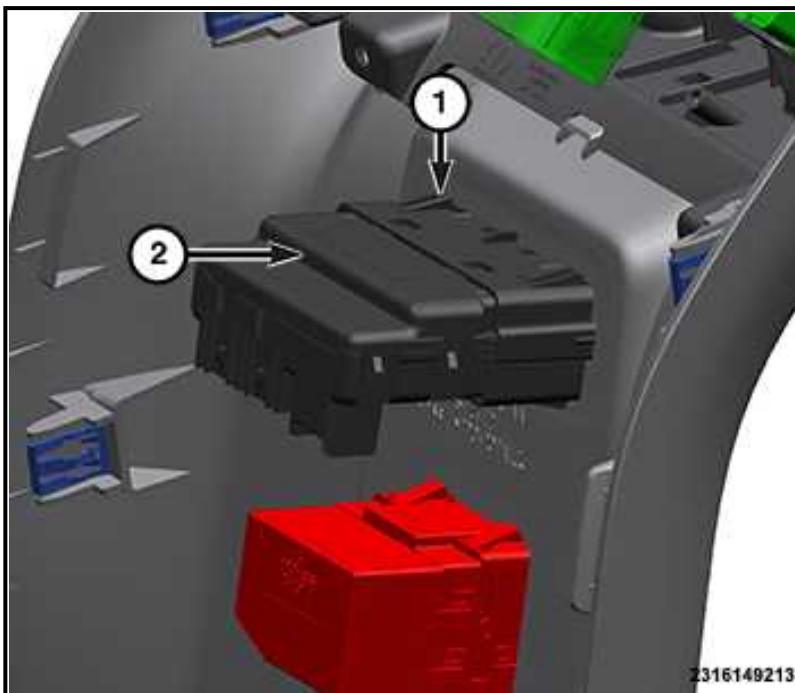
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).
2. Remove the floor console end cap. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#), or [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#).



3. Working inside the center console end cap using a trim tool or equivalent, release the four tabs (1) on the center console media hub (2), then remove.

INSTALLATION



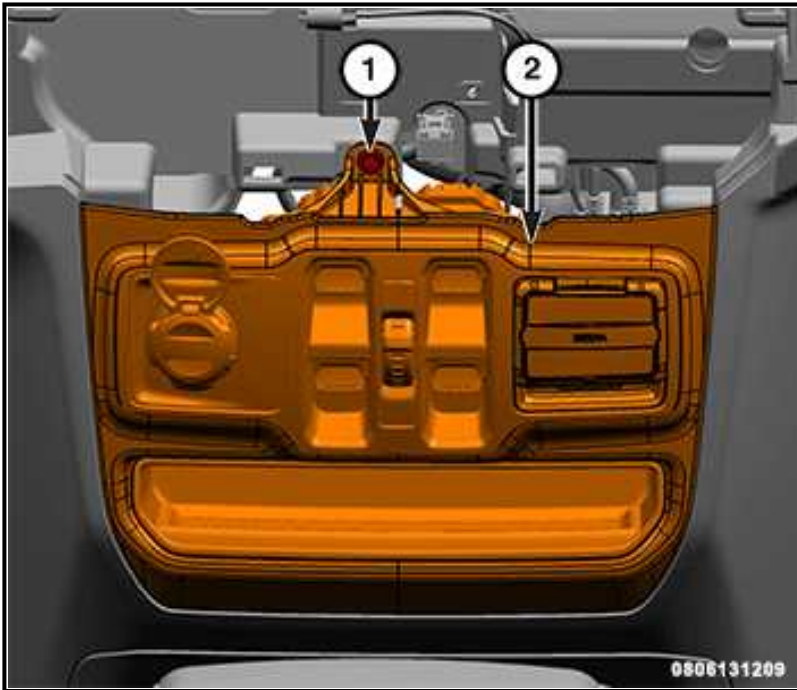
1. Install the floor console media hub (2) into the floor console end cap, be sure retaining clips (1) are fully engaged.
2. Install the floor console end cap. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) , or [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .
3. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

INSTRUMENT PANEL MEDIA HUB

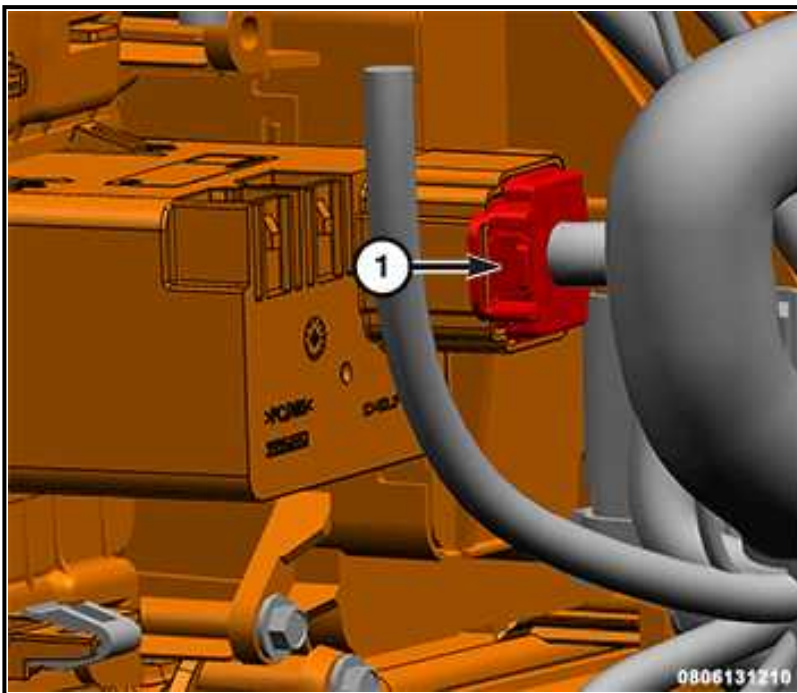
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

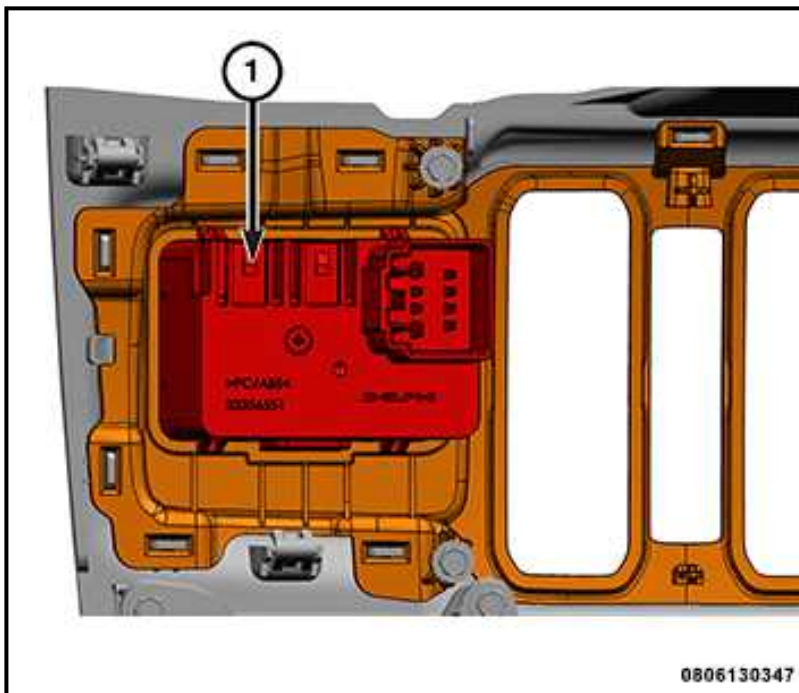
2. Remove the Integrated Center Stack (ICS). Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND INSTALLATION](#) .



3. Remove the fastener (1), then using a trim tool or equivalent, release the trim from the instrument panel.



4. Disconnect the wire harness connector (1) from the media hub.



5. Using a trim tool or equivalent tool, disengage the retaining tabs and remove the media hub (1) from the trim panel.

INSTALLATION

1. Install the media hub to the trim panel and verify the retaining tabs are fully engaged.
2. Install the wire harness connector to the media hub.
3. Install the instrument panel trim to the instrument panel, then install the fastener and tighten securely.
4. Install the ICS. Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).

MODULE, DIGITAL AUDIO BROADCASTING ANTENNA

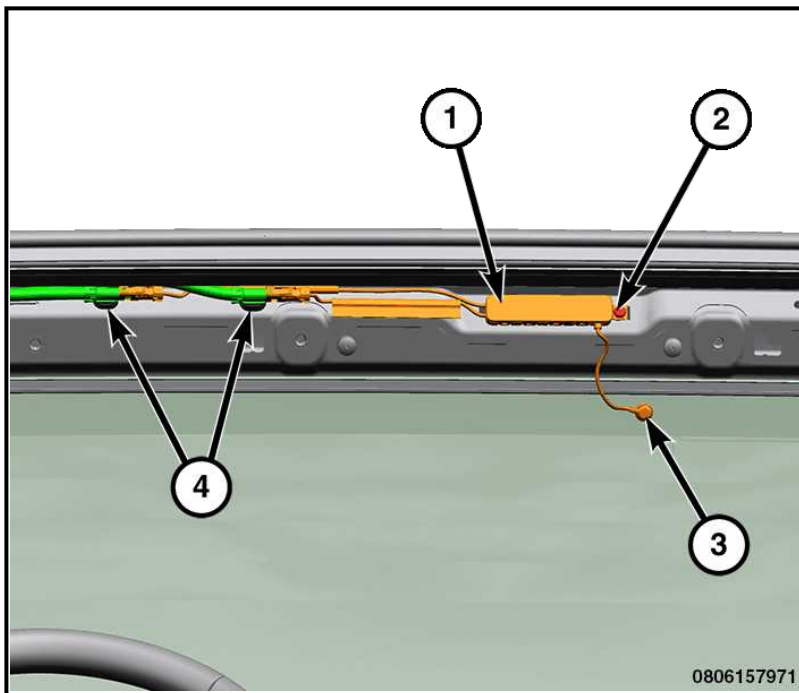
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

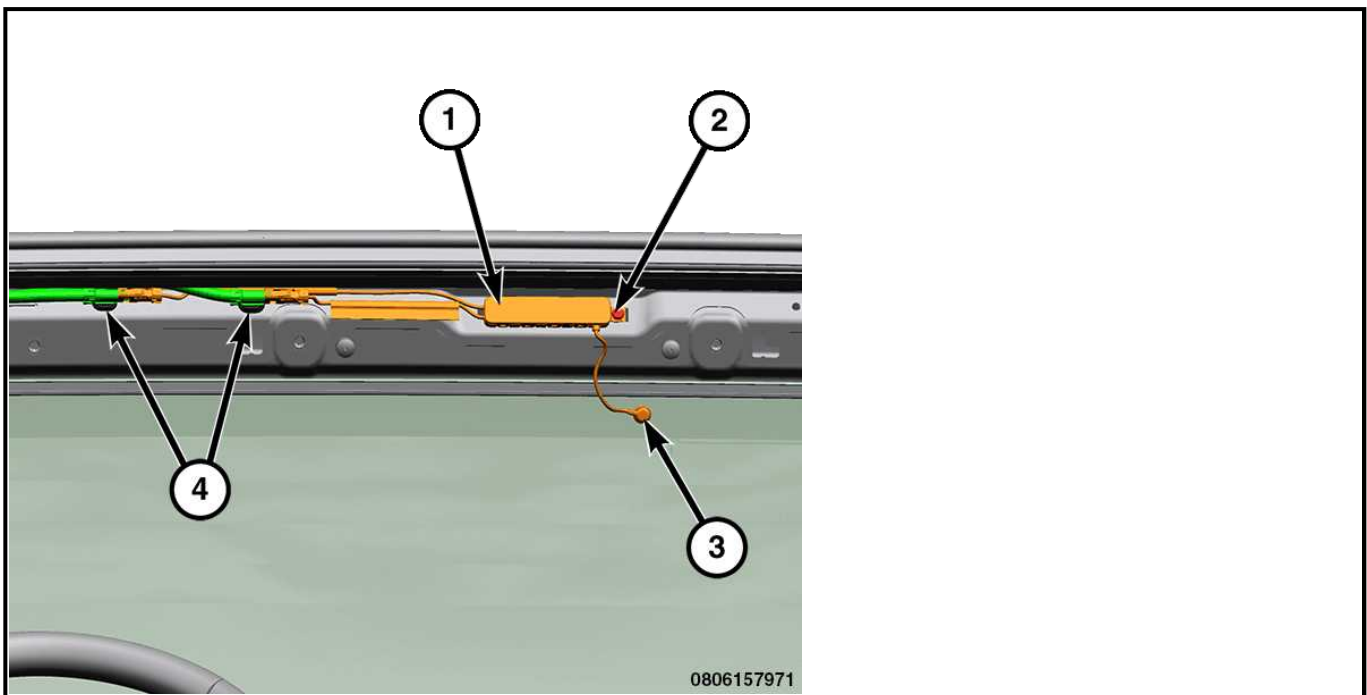
NOTE: The Digital Audio Broadcasting Antenna is service with the windshield. If replacing the antenna, refer to the windshield replacement. Refer to [WINDSHIELD, REMOVAL AND INSTALLATION](#).

Removal

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).
2. Lower the windshield frame. Refer to [FRAME, WINDSHIELD, REMOVAL AND INSTALLATION](#).



3. Disconnect the wire harness connectors (4).
4. Disconnect the antenna harness (3) from the windshield.
5. Remove the fastener (2) and remove the Digital Audio Broadcasting Antenna Module (1).



Installation

1. Position the Digital Audio Broadcasting Antenna Module (1) to the windshield frame.
2. Install the fastener (2) that retains the Digital Audio Broadcasting Antenna Module and tighten securely.
3. Connect the antenna harness (3) to the windshield.
4. Connect the wire harness connectors (4).
5. Raise and install the upper windshield frame. Refer to [FRAME, WINDSHIELD, REMOVAL AND INSTALLATION](#) .
6. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

SPEAKER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - SPEAKER

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION:

The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

Any diagnosis of the Audio system should begin with duplicating the customer concern (verify the problem), including checking for applicable Technical Service Bulletins (TSBs), Star Online Publications, and the use of a diagnostic scan tool. Check for any Diagnostic Trouble Code (DTC) data. If a DTC is found, refer to - Radio and perform the appropriate diagnostic procedure before proceeding in this information. Refer to the appropriate wiring information.

Speaker Buzz, Squeak, Rattle (BSR) Diagnosis and Testing

1. Begin by verifying the customer complaint. The exact conditions that caused the issue for the customer must be used. Pay close attention to the following details
 1. Type of input (Frequency Modulation/FM, Amplitude Modulation/AM, Satellite Digital Audio Radio Service/SDARS, Digital Audio Broadcast, Universal Serial Bus/USB, Auxiliary/AUX)
 2. Volume Level
 3. Audio settings, including bass and treble
2. Once the complaint has been reproduced, clear the map pocket and storage bins of all loose items around the speaker in question.
3. Attempt to reproduce the issue in a non-radio mode, such as BluetoothB®, or Auxiliary Input. This will help determine if it is a speaker issue or a reception issue.
4. If the speaker noise is still present, consult the Tech Connect home page / Service Library Dashboard and follow the instructions to download the Audio Test Files for Speaker Diagnosis to a USB drive.
5. Insert the USB drive in the proper input of the vehicle and then set the following radio settings:
 1. Bass at maximum
 2. Mid and treble at neutral
 3. Volume at step 30
6. Play all of the frequencies on the USB drive with the recommended settings. When a frequency reproduces the noise, press the interior panels around the speaker to see if the noise subsides. It may be necessary to replace broken trim clips or use foam tape to correct a speaker noise issue. Refer to the service information for additional details.

Electrical Diagnosis and Testing

The hardwired circuits between components related to the audio system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair and connector repair procedures. Refer to [**STANDARD PROCEDURE**](#) . Refer to [**REMOVAL**](#) , and Refer to [**INSTALLATION**](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the radio, the audio amplifier or the electronic controls and communication between modules and other devices that provide some features of the audio system. The most reliable, efficient and accurate means to diagnose the radio, the audio amplifier or the electronic controls and communication related to audio system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

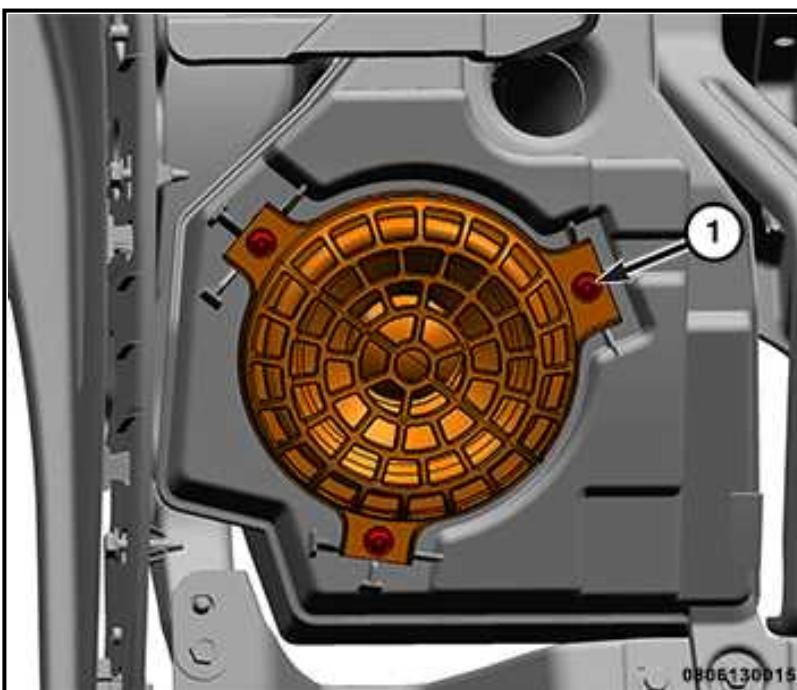
1. If all speakers are inoperative, inspect all of the radio related fuses. If OK, go to **Step 2** . If not OK, repair the shorted circuit or component as required and replace the ineffective fuse.
2. If equipped with an audio amplifier, check the fuse for the amplifier. If OK, go to **Step 3** . If not OK, repair the shorted circuit or component as required and replace the ineffective fuse.
3. Turn the ignition switch to the ON position. Turn the radio ON. Adjust the balance and fader control to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to **Step 4** .
4. Turn the radio OFF. Turn the ignition switch to the OFF position. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) . If the vehicle is **not** equipped with an audio amplifier, remove the radio. If the vehicle is equipped with an amplifier, disconnect the wire harness connector at the output side of the amplifier. Go to **Step 5** .
5. Check both the speaker feed (+) circuit and return (-) circuit cavities for the inoperative speaker at the radio wire harness connector for continuity to ground. There should be no continuity. If OK, go to **Step 6** . If not OK, repair the shorted speaker feed (+) and/or return (-) circuit(s) to the speaker as required.
6. Disconnect the wire harness connector at the inoperative speaker. Check for continuity between the speaker feed (+) circuit cavities of the radio wire harness connector or, if equipped, the audio amplifier wire harness connector and the speaker wire harness connector. Repeat the check between the speaker return (-) circuit cavities of the radio wire harness connector and the speaker wire harness connector. In each case, there should be continuity. If OK, replace the ineffective speaker. If not OK, repair the open speaker feed (+) and/or return (-) circuit(s) as required.

REMOVAL AND INSTALLATION

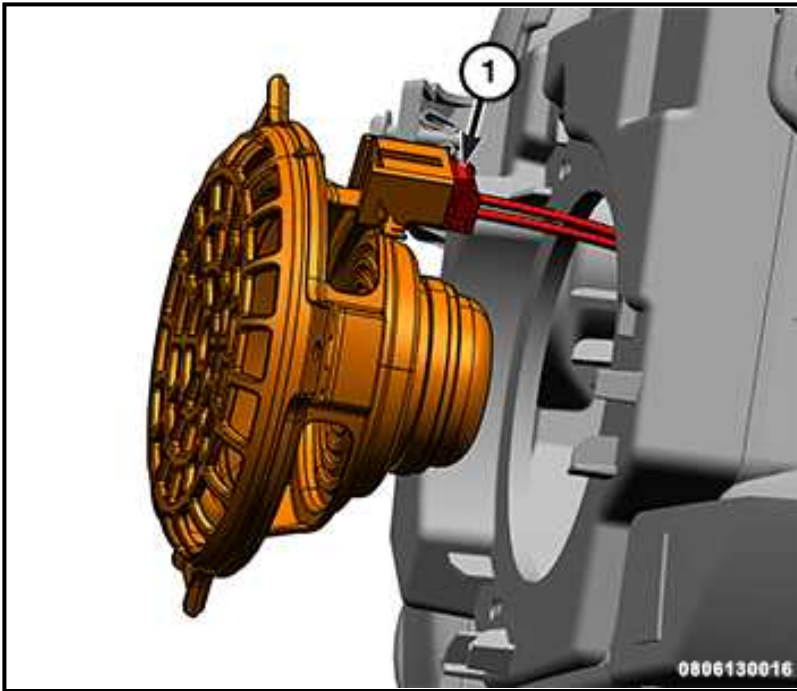
INSTRUMENT PANEL - DRIVER SIDE

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the driver side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .



3. Remove the speaker fasteners (1).



4. Disconnect the speaker wire harness connector (1).

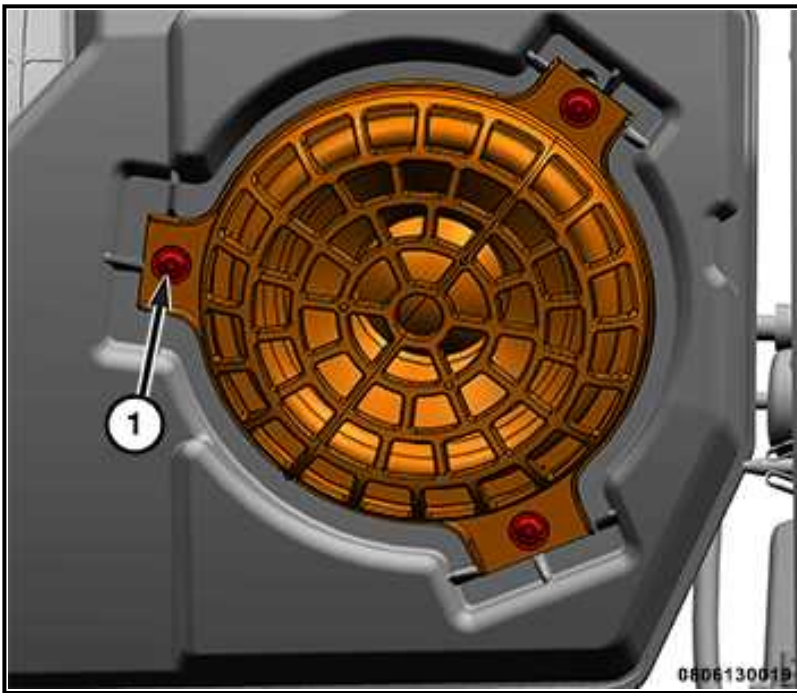
INSTALLATION

1. Connect the speaker wire harness connector.
2. Position the speaker to the speaker enclosure and install the speaker fasteners. Tighten the fasteners securely.
3. Install the driver side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

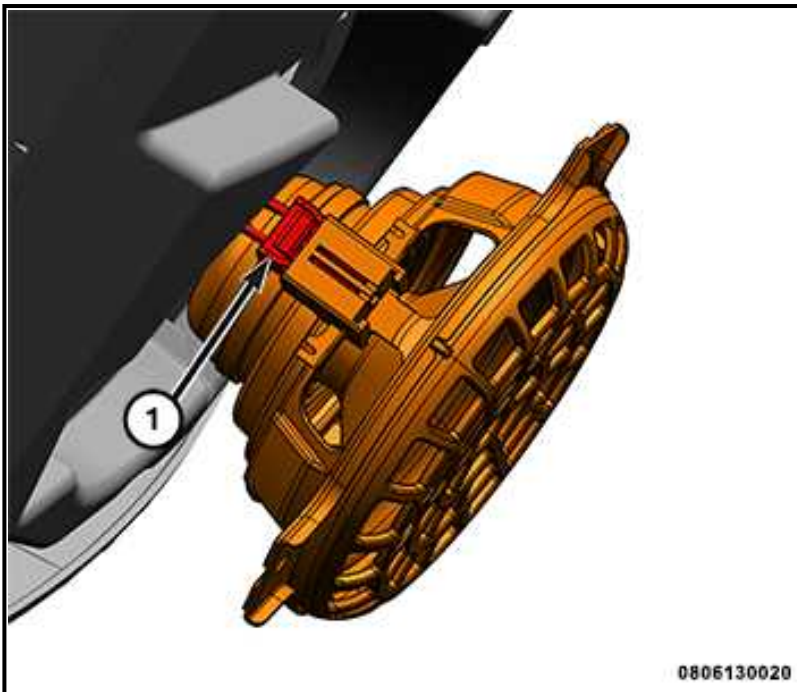
INSTRUMENT PANEL - PASSENGER SIDE

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the passenger side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .



3. Remove the speaker fasteners (1).



4. Disconnect the speaker wire harness connector (1).

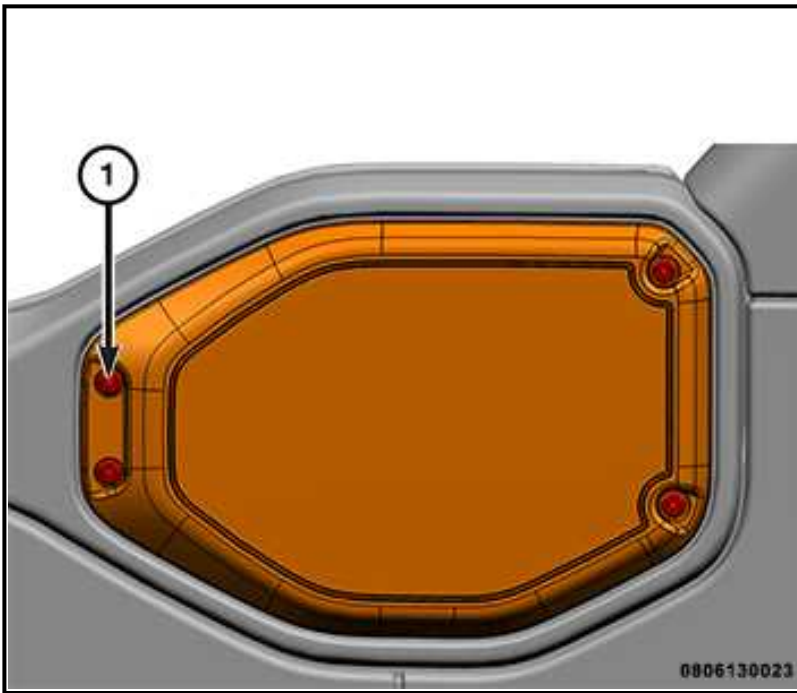
INSTALLATION

1. Connect the speaker wire harness connector.
2. Install the speaker fasteners.
3. Install the passenger side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).
4. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).

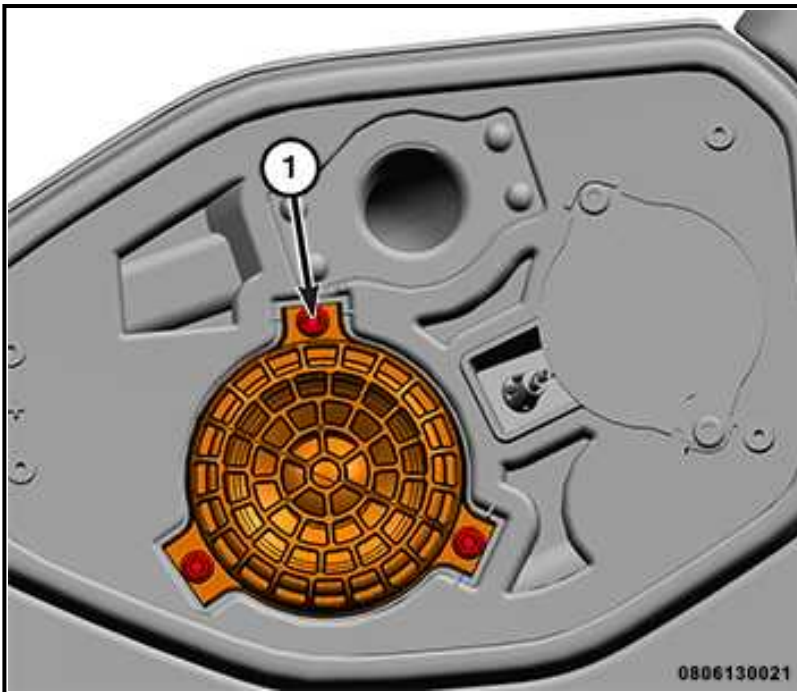
MID SOUND BAR

REMOVAL

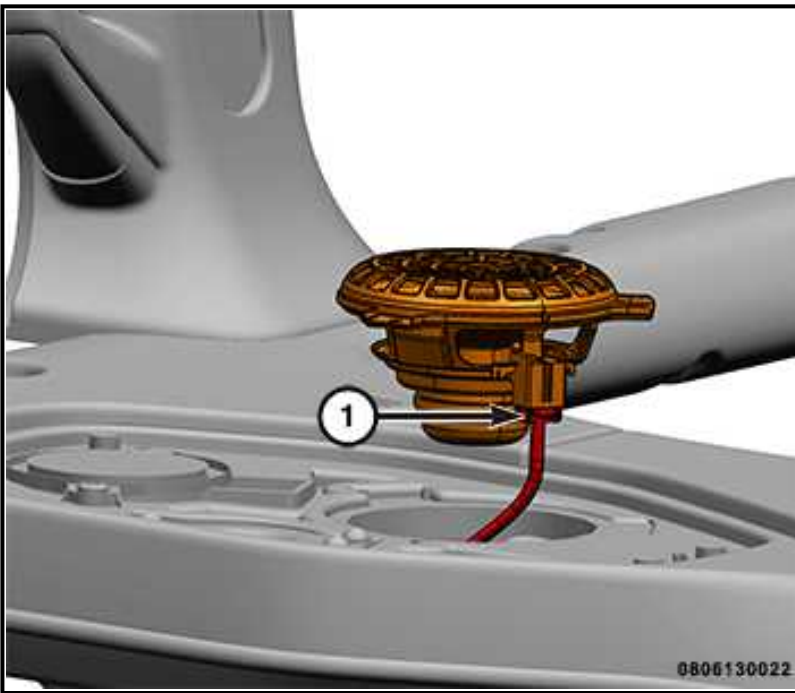
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).



2. Remove the fasteners (1) securing the speaker grille to the sound bar.



3. Remove the fasteners (1) securing the mid-range speaker to the sound bar.



4. Disconnect the wire harness connector (1).

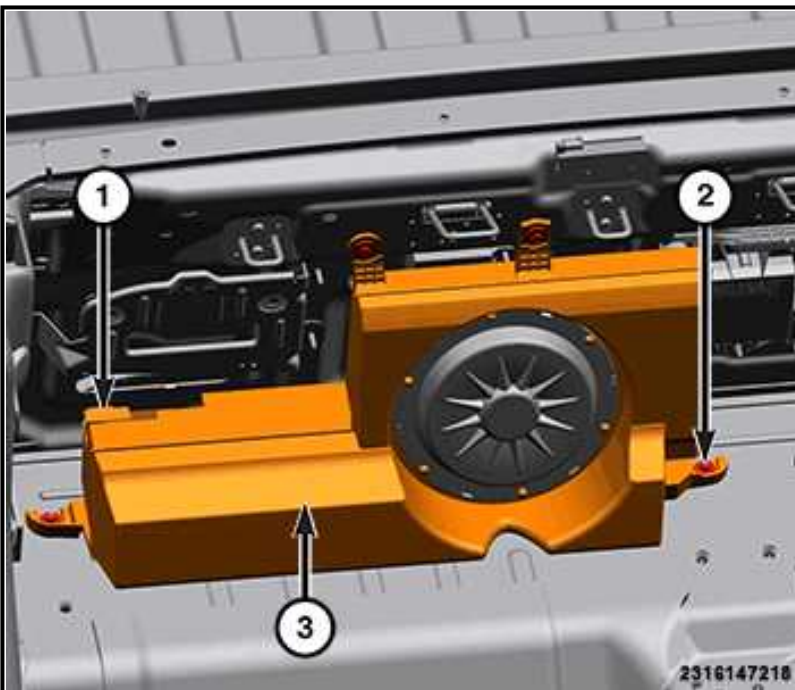
INSTALLATION

1. Connect the wire harness connector.
2. Install the fasteners securing the mid-range speaker to the sound bar and tighten securely.
3. Install the fasteners securing the speaker grille to the sound bar and tighten securely.
4. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

SUBWOOFER

REMOVAL

1. Remove the rear cab back trim panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .



2. Disconnect wire harness connector (1), remove four fasteners (2), and remove subwoofer (3).

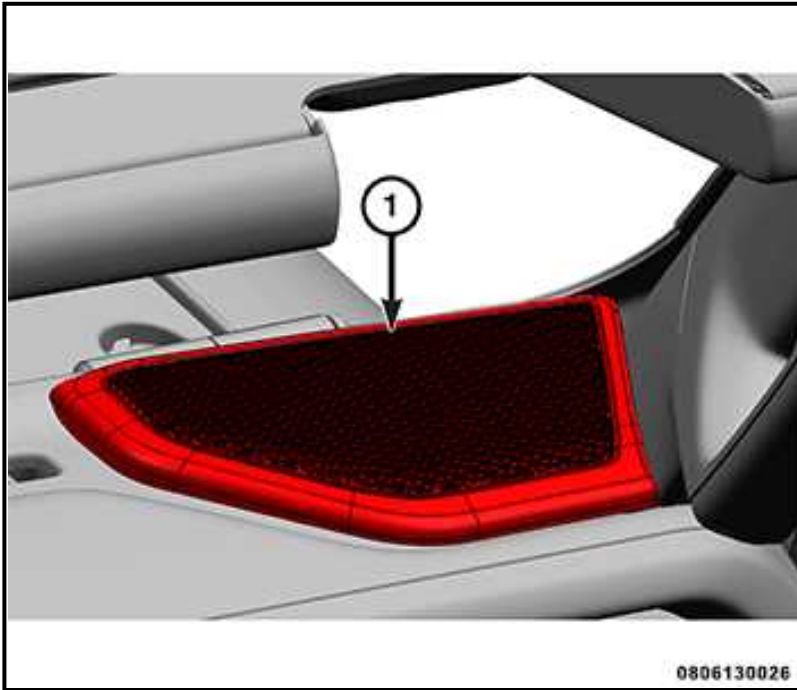
INSTALLATION

1. Position subwoofer onto mounting studs, connect wire harness connector, and install four fasteners and tighten securely.
2. Install the rear cab back trim panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .

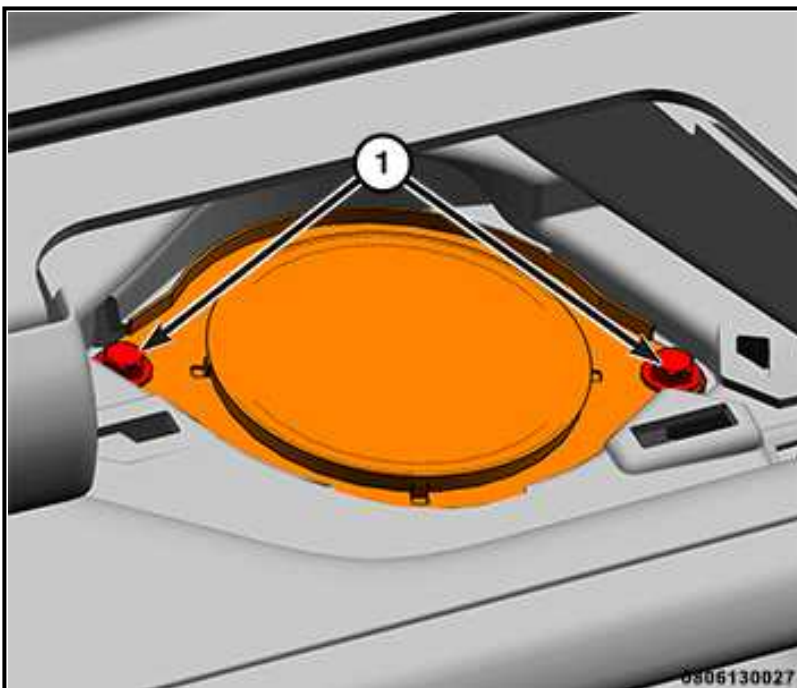
TWEETER - INSTRUMENT PANEL

REMOVAL

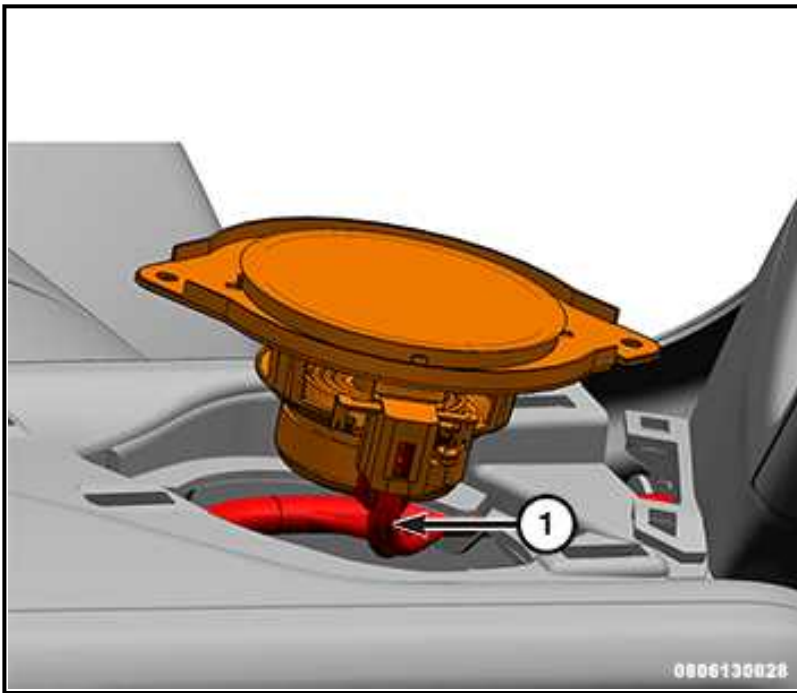
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .



2. Using trim tool or equivalent, gently remove the tweeter speaker grille (1).



3. Remove the fasteners (1) securing the tweeter speaker to the instrument panel.



4. Disconnect the wire harness connector (1).

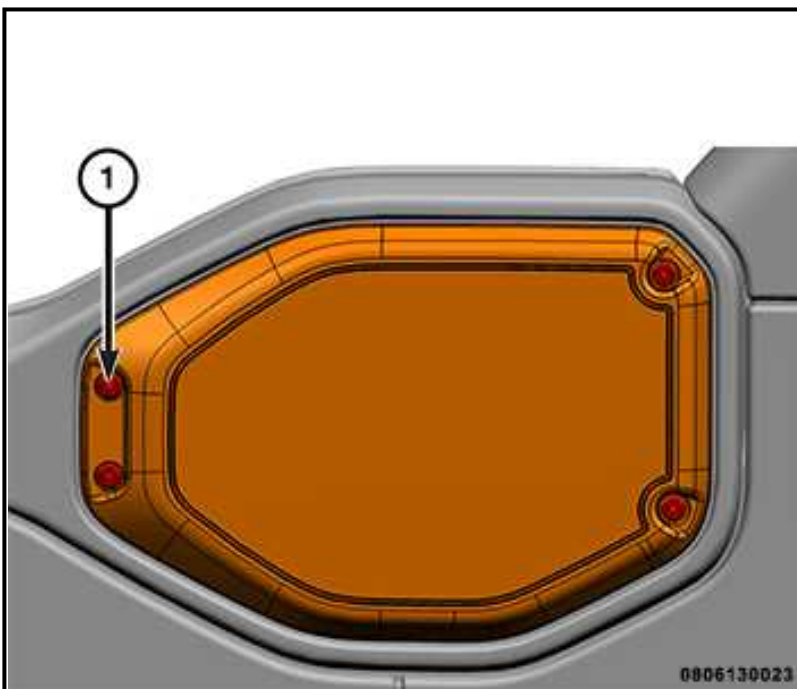
INSTALLATION

1. Connect the wire harness connector.
2. Install the fasteners securing the tweeter speaker to the instrument panel and tighten securely.
3. Install the tweeter speaker grille to the instrument panel.
4. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

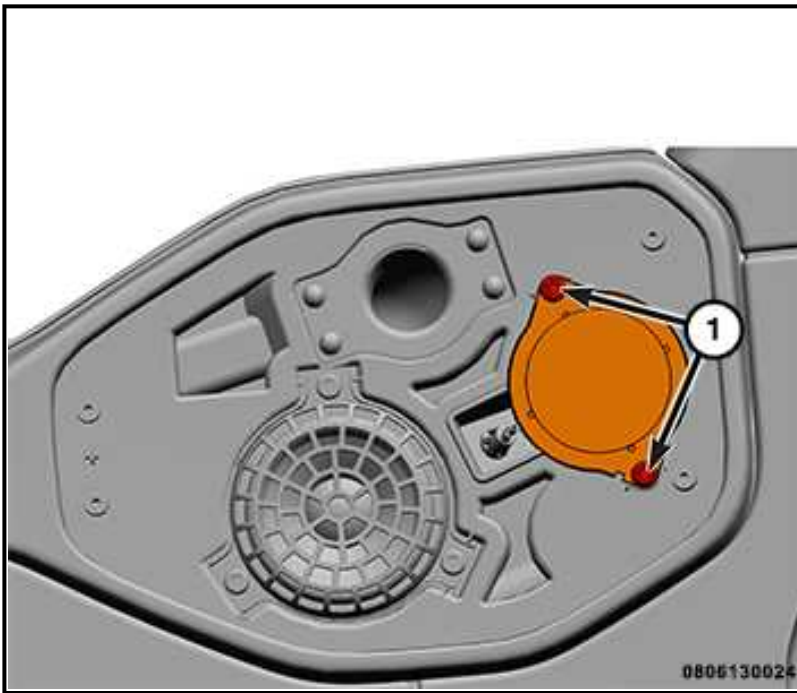
TWEETER - SOUND BAR

REMOVAL

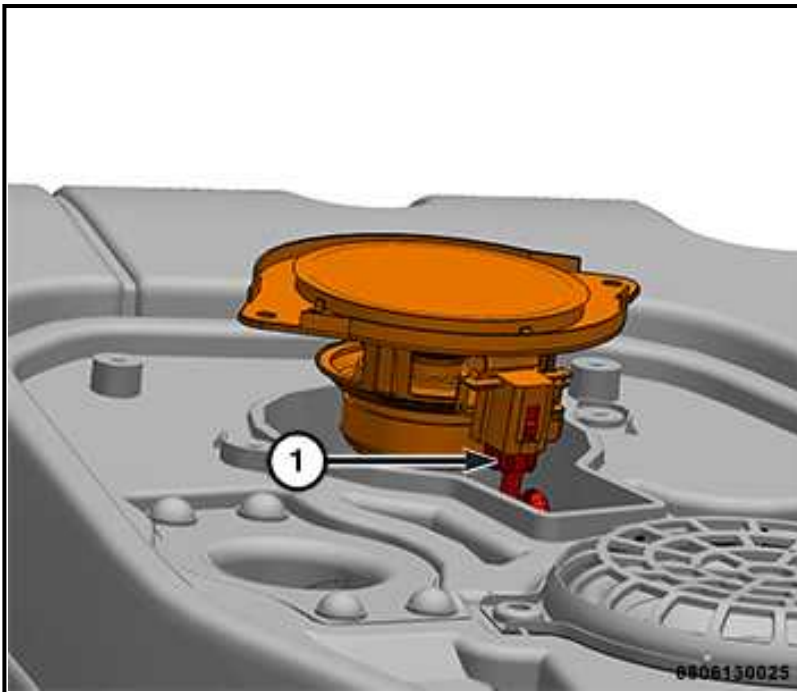
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .



2. Remove the fasteners (1) securing the speaker grille to the sound bar.



3. Remove the fasteners (1) securing the tweeter speaker to the sound bar.



4. Disconnect the wire harness connector (1).

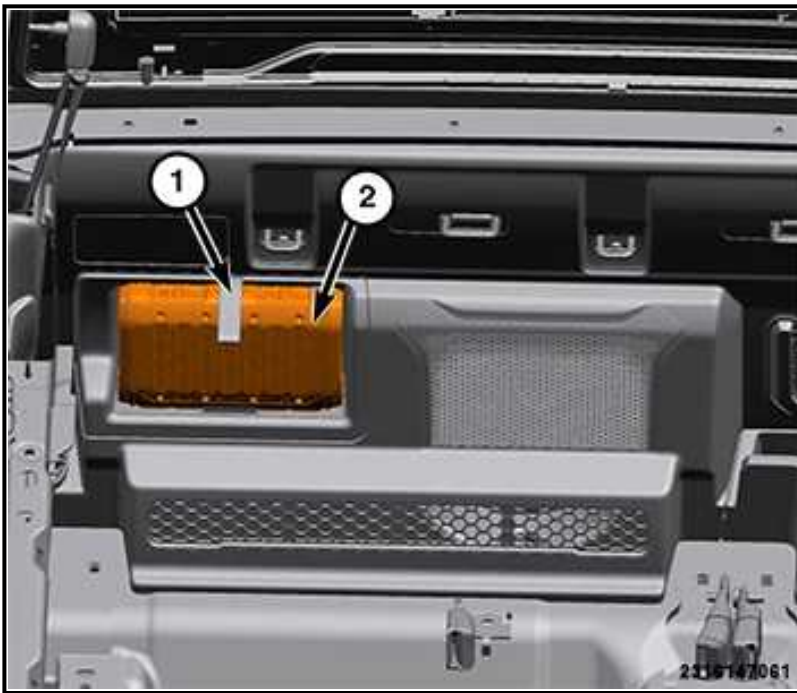
INSTALLATION

1. Connect the wire harness connector.
2. Install the fasteners securing the tweeter speaker to the sound bar and tighten securely.
3. Install the fasteners securing the speaker grille to the sound bar and tighten securely.
4. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

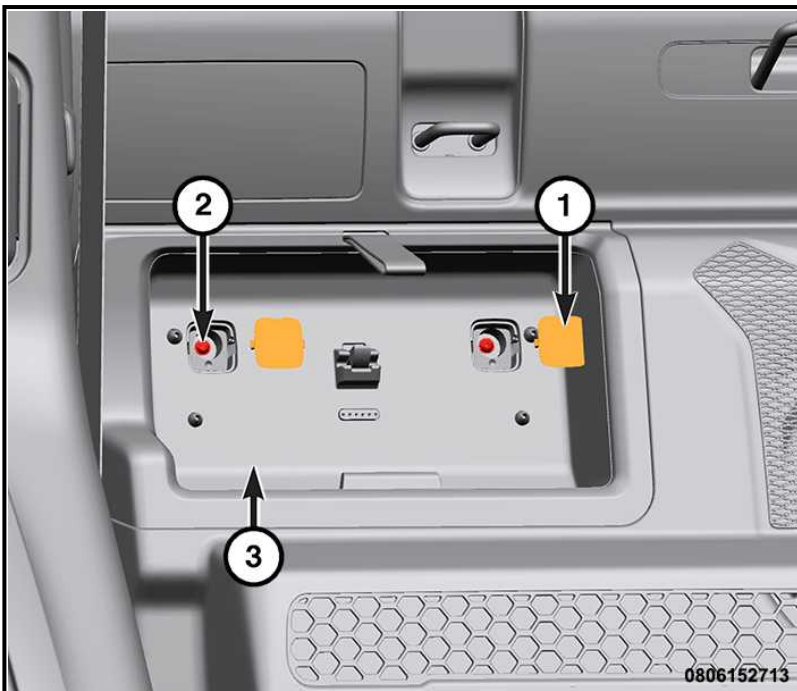
WIRELESS

REMOVAL

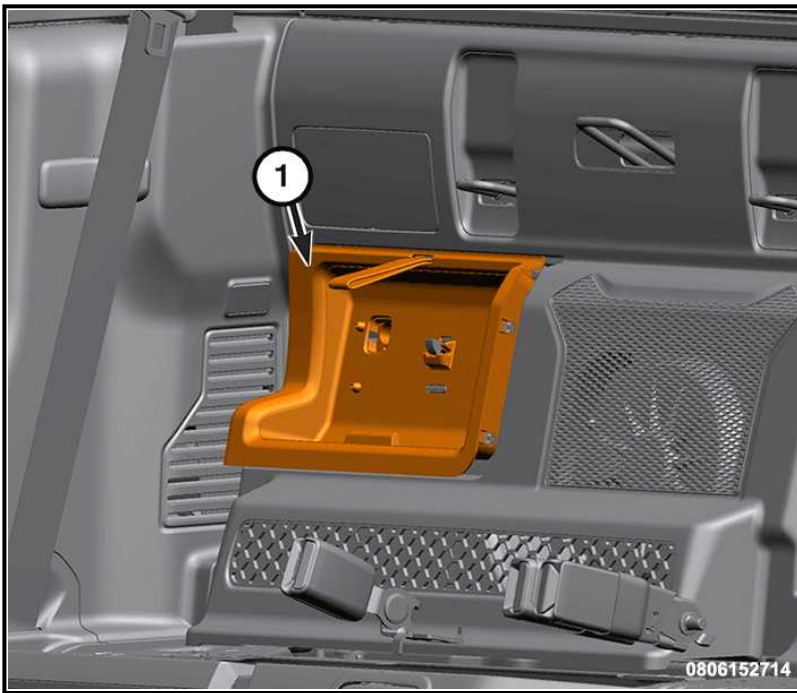
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Lower the back of the upper rear seat.



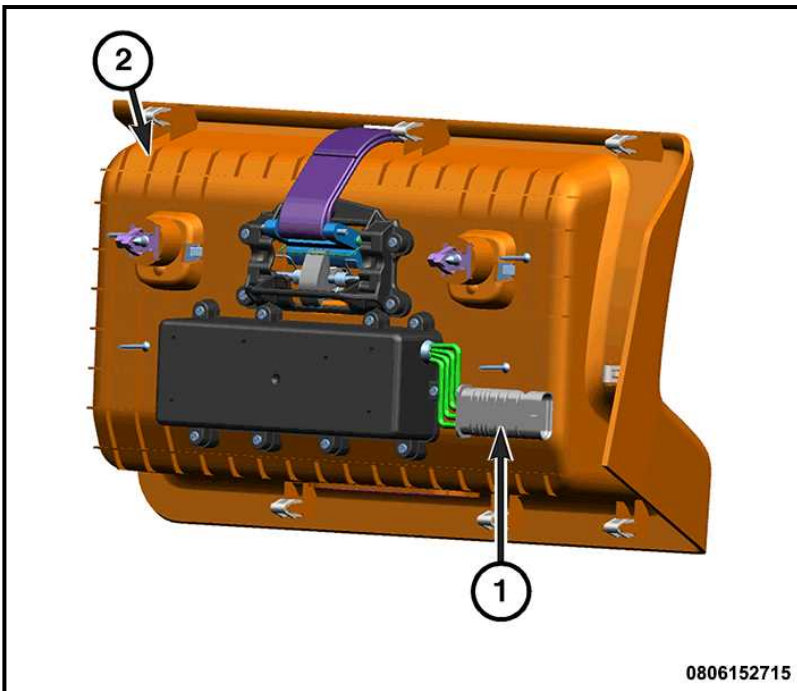
3. Release the bluetooth wireless speaker (2) from the charging carrier by pulling the release handle (1) and remove the speaker from the vehicle.



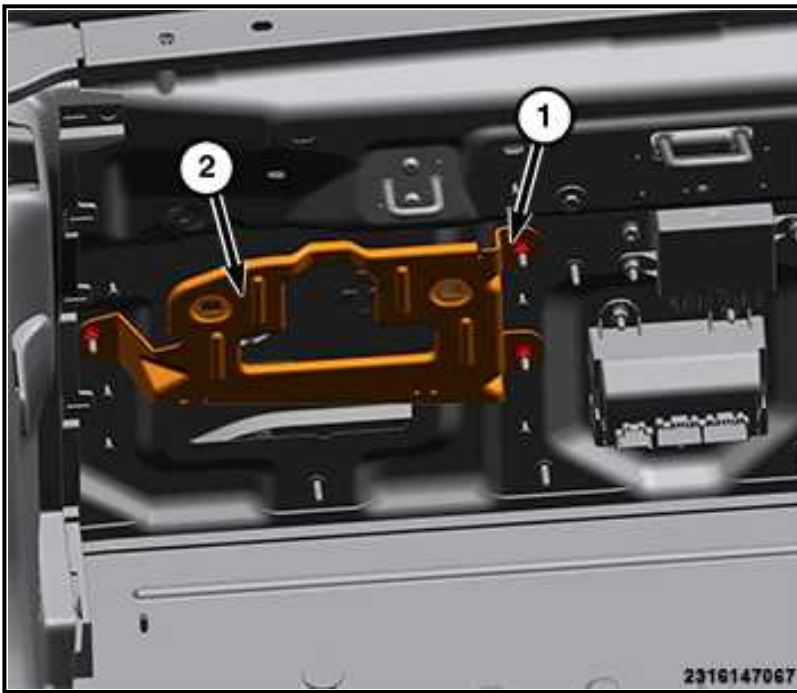
4. To remove the wireless speaker charging carrier, remove the two screw covers (1) and the screws (2).



5. Using a trim stick or equivalent, release the wireless speaker charging carrier (1) from the rear cab trim panel.



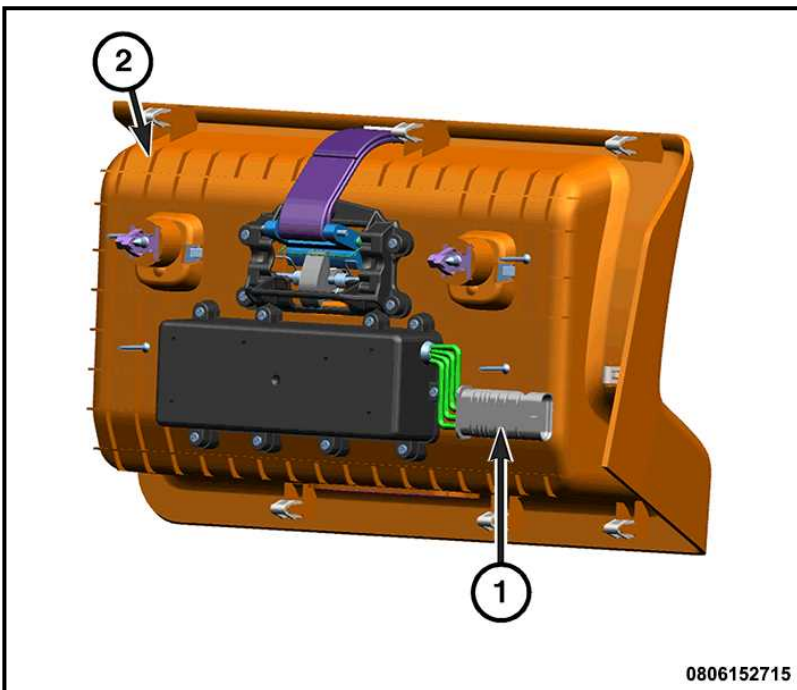
6. Disconnect the wire harness connector (1) and remove the wireless speaker carrier (2).
7. To remove the charging carrier bracket, remove the rear cab back trim panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .



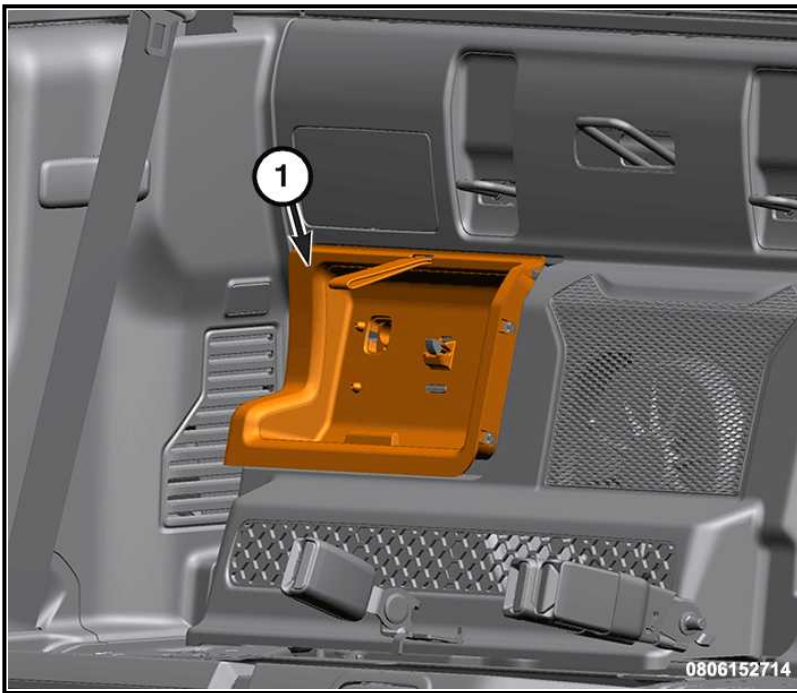
8. Remove the three fasteners (1) and remove the charging carrier bracket (2).

INSTALLATION

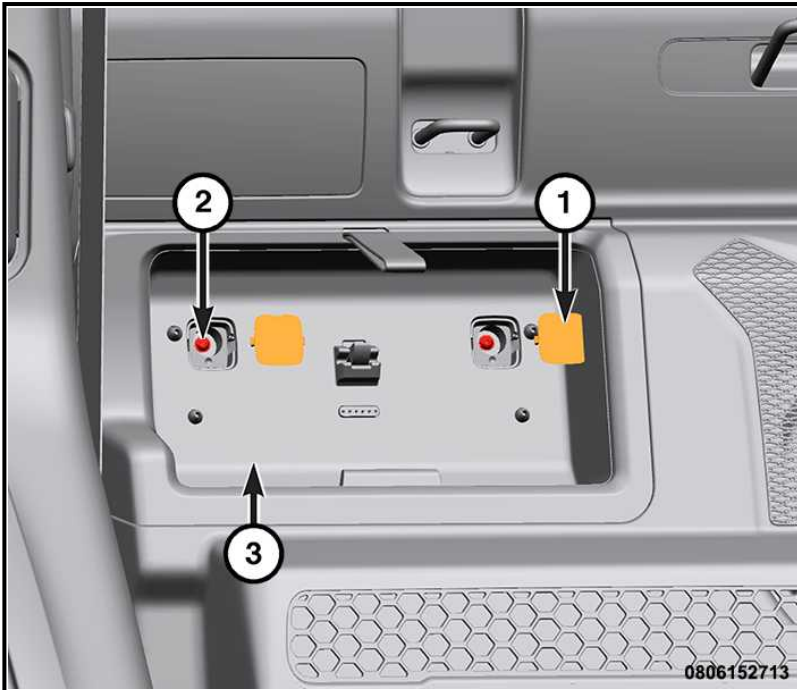
1. If the wireless speaker charging carrier bracket was not removed, go to **Step 4** .
2. If the wireless speaker charging carrier bracket was removed, position the wireless speaker charging carrier bracket to the mounting studs, then install the three fasteners and tighten securely.
3. Install the rear cab back trim panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .



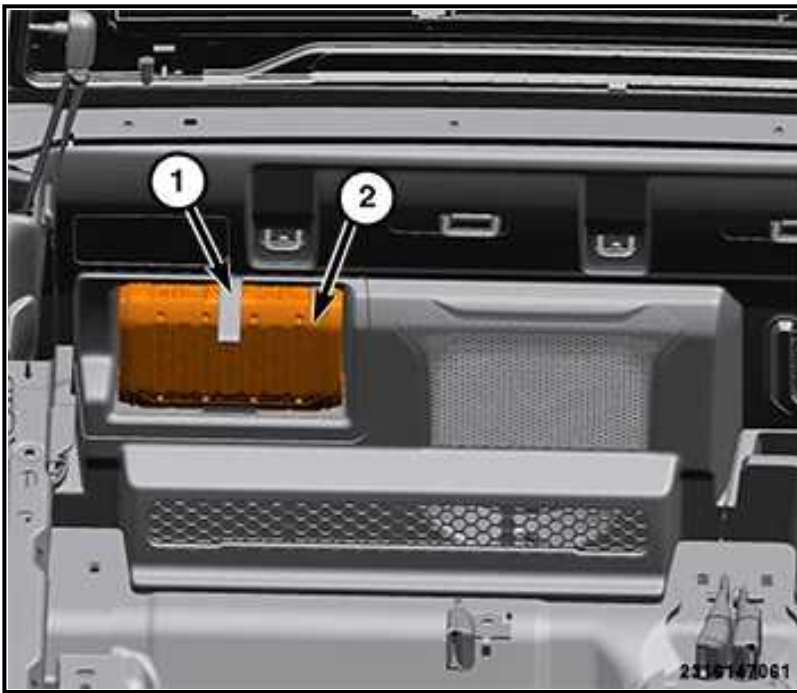
4. If the charging carrier was removed, position the charging carrier (2) to the rear cab trim and connect the wire harness connector (1).



5. Insert the wireless speaker charging carrier (1) into the rear cab panel trim by pressing the charging carrier to engage the retainer clips.



6. Install the two screws (2) that secure the charging carrier (3) and tighten securely. Install the screw covers (1).



7. Insert the wireless speaker (2) into the charging carrier and raise the rear seat back.
8. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .

SWITCH, REMOTE RADIO

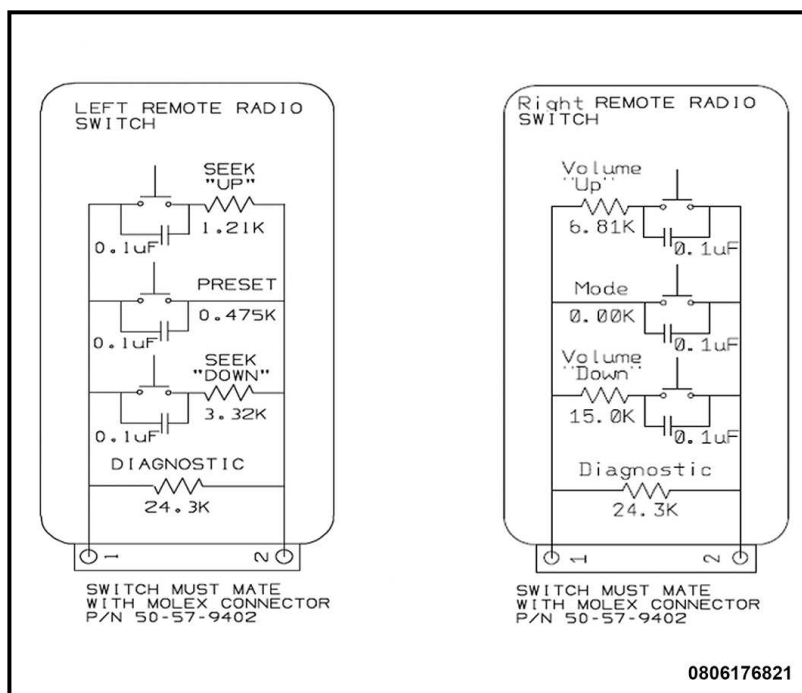
DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - REMOTE RADIO SWITCHES

WARNING: On vehicles equipped with airbags, refer to electrical, restraints before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

Any diagnosis of the Audio system should begin with duplicating the customer concern (verify the problem), including checking for applicable Technical Service Bulletins (TSB), Star Online Publications, and the use of a diagnostic scan tool. Check for any Diagnostic Trouble Code (DTC) data. If a DTC is found, refer to - Radio and perform the appropriate diagnostic procedure before proceeding in this information. Refer to the appropriate wiring information.

1. Remove the remote radio switch(es) from the steering wheel. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#).



2. Use an ohmmeter to check the switch resistances at the switch connector while pressing each button. The resistance values must match those shown in the Remote Radio Switch Test chart.
3. If the switch resistance checks OK, go to **Step 4** . If not OK, replace the faulty switch.

REMOTE RADIO SWITCH TEST				
Switch	Switch Position	Minimum Resistance (kilohms)	Nominal Resistance (kilohms)	Maximum Resistance (kilohms)
Right	Volume Up	4.788	5.32	5.852
Right	Volume Down	8.343	9.27	10.197
Right	Mode Advance	0	0	0.05
Left	Seek Up	1.089	1.21	1.331
Left	Seek Down	2.988	3.32	3.652
Left	Pre-Set Station Advance	0.427	0.475	0.522

4. Check for continuity between the ground circuit cavity of the steering wheel wire harness connectors for the switches and a known good ground. There should be continuity. If OK, go to **Step 5** . If not OK, repair the open ground circuit as required.
5. Disconnect the appropriate wire harness connector from the Body Control Module (BCM). Check for continuity between the radio control circuit cavity of the steering wire harness connectors for the switches and ground. There should be no continuity. If OK, go to **Step 6** . If not OK, repair the shorted radio control circuit as required.
6. Check for continuity between the radio control circuit cavities of the steering wheel wire harness connectors for the switches and the BCM wire harness connector. There should be continuity. If OK, use a diagnostic scan tool and the appropriate diagnostic procedures to test the BCM, the radio and the Controller Area Network (CAN) data bus. If not OK, repair the open radio control circuit as required.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

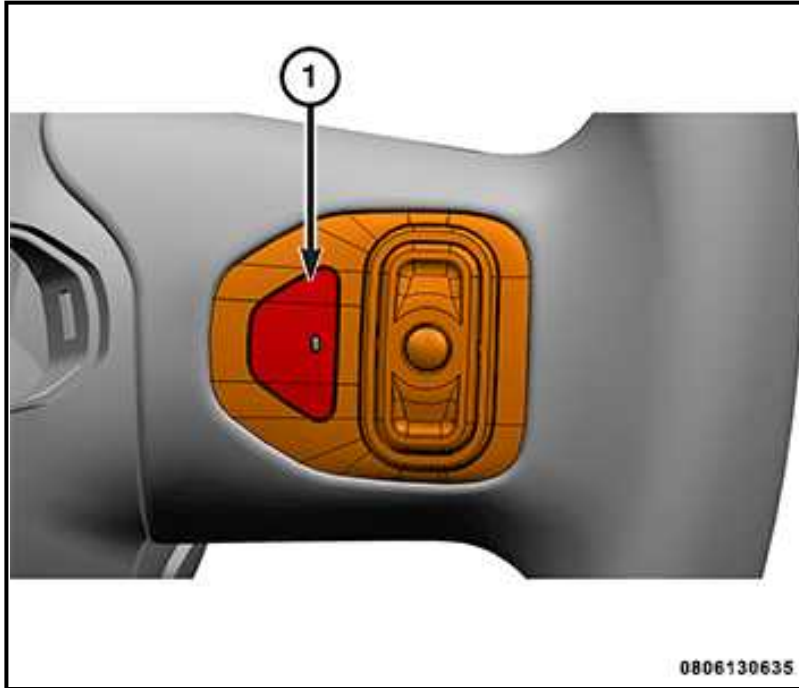
REMOVAL

WARNING:

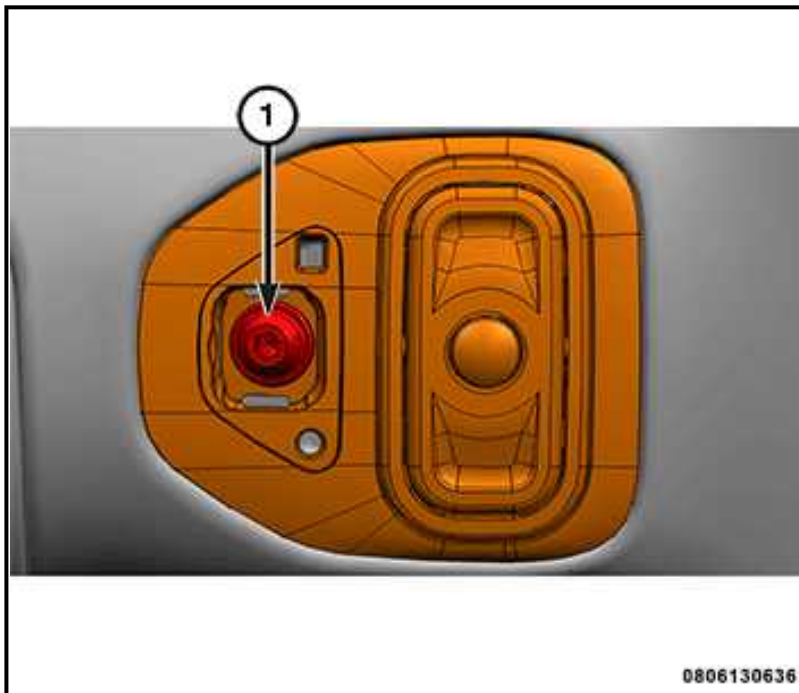
To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service.

Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

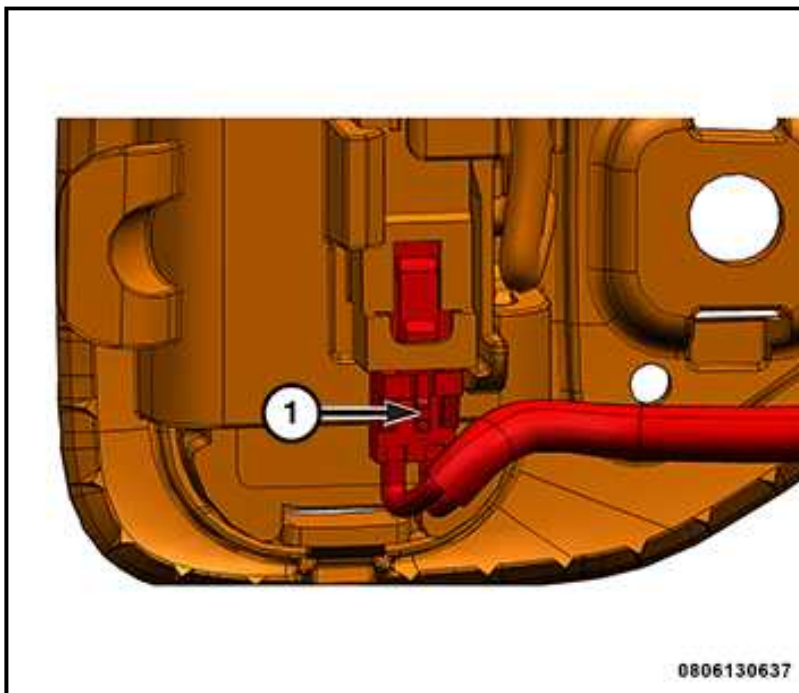
1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .



2. Working from the back of the steering wheel, unsnap and remove the remote radio switch cover (1) from the remote radio switch.



3. Remove the fastener (1) that secures the remote radio switch to the steering wheel spoke armature.
4. Carefully pull the remote radio switch away from the steering wheel spoke armature.



5. Carefully disconnect the remote radio switch connector (1) from the remote radio switch.

INSTALLATION

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. Working from the back of the steering wheel, connect the remote radio switch connector to the remote radio switch.
 2. Position and carefully install the remote radio switch and wire harness to the steering wheel spoke armature.
 3. Install and securely tighten the fastener for the remote radio switch to the steering wheel.
 4. Install the remote radio switch cover. Be certain that the cover is snapped securely into place.
 5. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
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2021 ACCESSORIES AND BODY, CAB

Body - Interior & Exterior (1 Of 2) - Gladiator

WARNING

USE OF HEAT DURING REPAIR

Be certain to follow guidance and instructions as found in the Use of Heat While Repairing Damaged Structural And Non-Structural Components as found in Service Bulletins/31-Collision Bulletins and Collision Information/Position Statements.

WARNING: Failure to follow these instructions may result in possible serious or fatal injury.

WARNINGS

WARNING: Use an Occupational Safety and Health Administration (OSHA) approved breathing filter, when spraying paint or solvents in a confined area. Failure to follow these instructions may result in possible serious or fatal injury.

- Avoid prolonged skin contact with petroleum or alcohol based cleaning solvents.
- Do not stand under a hoisted vehicle that is not properly supported on safety stands. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: On vehicles equipped with the high voltage system, disconnecting the 12-volt battery negative cable alone will not power down the 12-volt system. You must perform the 12-volt Power Down procedure before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

CAUTION: When holes are drilled or punched in an inner body panel, verify the depth of space to the outer body panel, electrical wiring or other components. Damage to the vehicle can result.

- Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.
- Always have a fire extinguisher ready for use when welding.
- Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is off. Damage to electrical system can result.
- Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.
- Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.
- Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.

WARNING: There are necessary safety factors to follow when working with components made of magnesium and components made of a combination of materials utilizing magnesium that must be followed.

- Do not grind on the component. The grinding residue is highly combustible.
- In the event of a fire, a D-class rated fire extinguisher is necessary to extinguish.
- Do not expose the component to open flame or temperature in excess of 260B° C. (500B° F).

Failure to follow these instructions may cause serious injury or death.

NOTE:

Due to the usage of magnesium, do not attempt to repair the swing gate inner panel on this vehicle. For further information refer to the Collision Information Swing Gate Inner Panel DO NOT REPAIR (Refer to the appropriate service information).

RESTRAINT WARNINGS

WARNING:

To avoid serious or fatal injury during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or ineffective buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or ineffective seat belt and child restraint components with the correct, new and unused replacement parts listed in the MoparB® Parts Catalog. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING:

To avoid serious or fatal injury on vehicles equipped with the Supplemental Restraint System (SRS), never attempt to repair the electrically conductive circuits or wiring components related to the SRS for which there is no MoparB® wiring repair kit. It is important to use ONLY the recommended splicing kit and procedure. For applicable and available MoparB® wiring repair kits, please visit the MoparB® Connection Repair Kit Web Site. Inappropriate repairs can compromise the conductivity and current carrying capacity of those critical electrical circuits, which may cause SRS components not to deploy when required, or to deploy when not required. Only minor cuts or abrasions of wire and terminal insulation where the conductive material has not been damaged, or connector insulators where the integrity of the latching and locking mechanisms have not been compromised may be repaired using appropriate methods.

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, Occupant Classification System (OCS), seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to follow these instructions may result in accidental airbag deployment.

WARNING:

To avoid potential physical injury or damage to sensitive electronic circuits and systems, always disconnect and isolate the battery negative (ground) cable and the positive cable, then ground the positive cable to discharge the Occupant

Restraint Controller (ORC) capacitor before performing any welding operations on the vehicle. Failure to take the proper precautions could result in accidental airbag deployment, possible damage to the Supplemental Restraint System (SRS) circuits and components, and possible damage to other electronic circuits and components. Whenever a welding process is being performed within 12 inches (30 centimeters) of an electronic module or wiring harness, then that module or harness should be relocated out of the way, or disconnected. Always protect against component or vehicle damage from weld spatter by using weld blankets and screens.

WARNING: To avoid serious or fatal injury, do not attempt to dismantle an airbag unit or tamper with its inflator. Do not puncture, incinerate or bring into contact with electricity. Do not store at temperatures exceeding 93B° C (200B° F). An airbag inflator unit may contain sodium azide and potassium nitrate. These materials are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases (sodium hydroxide is formed in the presence of moisture) or combustible compounds. An airbag inflator unit may also contain a gas canister pressurized to over 17.24 kPa (2500 psi). Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: To avoid serious or fatal injury when handling a seat belt tensioner retractor. Exercise proper care to keep fingers out from under the retractor cover and away from the seat belt webbing where it exits from the retractor cover. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: To avoid serious or fatal injury, replace all Supplemental Restraint System (SRS) components only with parts specified in the MoparB® Parts Catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection.

WARNING: To avoid serious or fatal injury, the fasteners, screws, and bolts originally used for the Supplemental Restraint System (SRS) components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the SRS. Anytime a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the MoparB® Parts Catalog.

WARNING: To avoid serious or fatal injury when a steering column has an airbag unit attached, never place the column on the floor or any other surface with the steering wheel or airbag unit face down. Failure to follow these instructions may result in possible serious or fatal injury.

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or

latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: Do not use electric shop lights or tools in water test area. Personal injury can result.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations. Refer to

HOISTING, STANDARD PROCEDURE.

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to make sure adequate voltage is supplied to the blower. With interior

pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

JL/JT HARD TOP WATER MANAGEMENT DIAGNOSIS AND TESTING

OVERALL WATER LEAKS DIAGNOSIS AND TESTING

WATER LEAK CONDITION INDEX

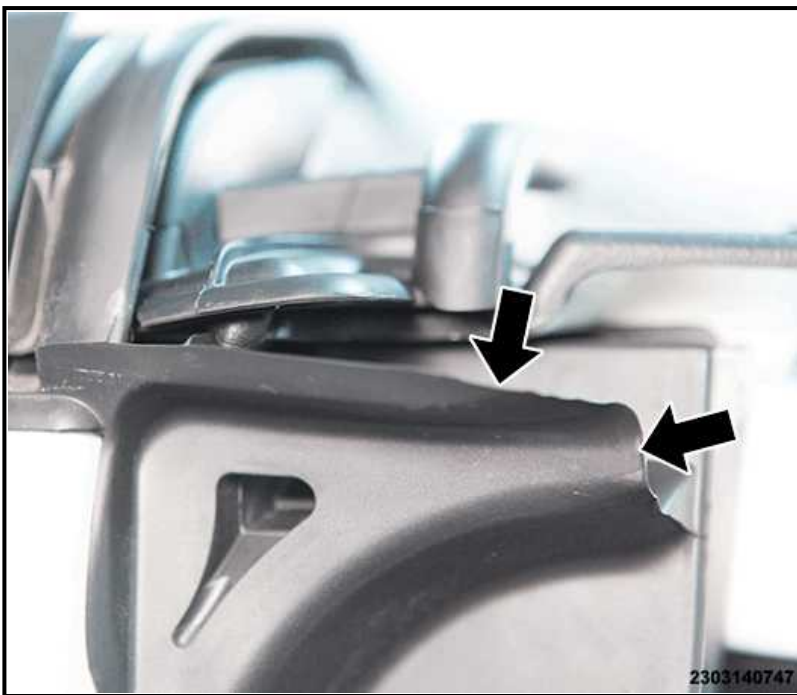
Water Leak Tech Tips and Repair Videos	1. Refer to A-PILLAR WATER LEAKS DIAGNOSIS AND TESTING VIDEO. 2. Refer to A-PILLAR AND COWL WATER LEAK REPAIR TIPS VIDEO. 3. Refer to B-PILLAR AND COWL WATER LEAK REPAIR TIPS VIDEO. 4. Refer to B-PILLAR AND COWL WATER LEAK REPAIR TIPS VIDEO.	
LOCATION	POSSIBLE CAUSES	CORRECTIONS
Water is on the A-pillar or side of the instrument panel	1. Freedom Panels 2. Header Seal 3. Doors 4. Windshield Frame	1. Refer to FREEDOM PANELS CORRECTIONS. 2. Refer to HEADER SEAL CORRECTIONS. 3. Refer to DOOR CORRECTIONS. 4. Refer to WINDSHIELD FRAME CORRECTIONS.
Water is on the front door trim panel of lower sill trim	1. Doors 2. Freedom Panels	1. Refer to DOOR CORRECTIONS. 2. Refer to FREEDOM PANELS CORRECTIONS.
Water is on the cowl side, floor board, or on the side of the instrument panel	1. Cowl Seal 2. Cowl Grille/Plenum 3. Cowl/Dash Body Side	1. Refer to COWL SEAL CORRECTIONS. 2. Refer to COWL GRILLE/PLENUM CORRECTIONS. 3. Refer to COWL/DASH BODY SIDE CORRECTIONS.
Water is on the center of the instrument panel or center of speaker bar	1. Freedom Panels 2. Hard Top Seal 3. Windshield Frame	1. Refer to FREEDOM PANELS CORRECTIONS. 2. Refer to HARD TOP SEAL CORRECTIONS. 3. Refer to WINDSHIELD FRAME CORRECTIONS.
Water Over Rear Sport Bar or B-pillar	1. Hard Top Seal 2. B-Pillar Mocket 3. Doors 4. Freedom Panel	1. Refer to HARD TOP SEAL CORRECTIONS. 2. Refer to B-PILLAR MUCKET CORRECTIONS. 3. Refer to DOOR CORRECTIONS. 4. Refer to FREEDOM PANELS CORRECTIONS.

B-PILLAR MUCKET CORRECTIONS

Refer to [WATER LEAK CONDITION INDEX](#).



1. Check to verify the super mocket is not sitting too far outboard on the B-pillar. Press in with top fully secured to address this issue.



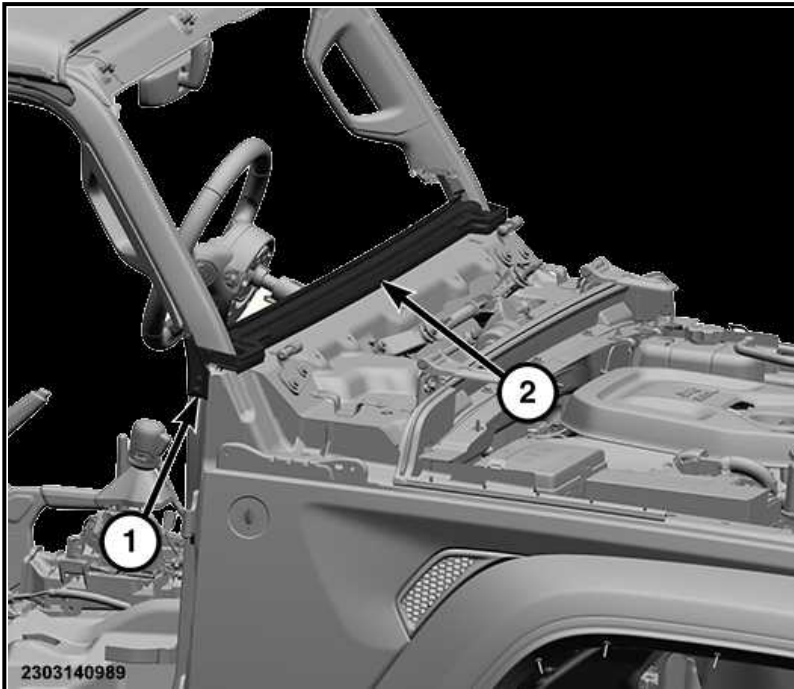
2. Verify the feathered edge of the super mocket is not rolled underneath the panel or damaged.



3. Verify the sure push pins are fully seated to prevent super mucket from traveling off position.

COWL SEAL CORRECTIONS

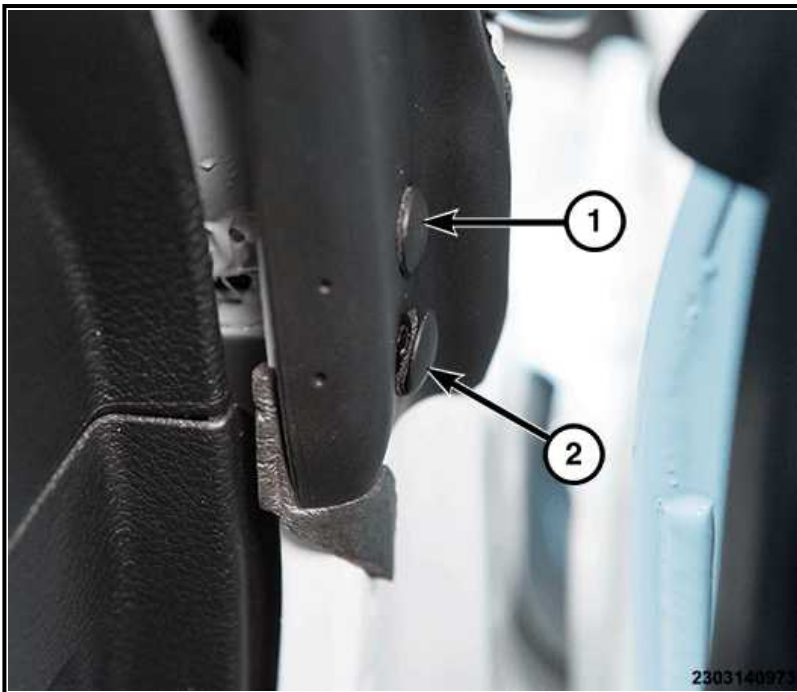
Refer to [WATER LEAK CONDITION INDEX](#).



1. Verify the seal (2) is seated down on plenum/baffle and that no abnormal rotation of the seal is observed around the sport bar (1).



2. Check vertical foam strip on top of seal and large foam on side of seal for gaps or damage.



3. Verify the cowl seal pins are fully seated. Pin (1) is seated correctly and pin (2) needs to be corrected. A mallet may be required to make sure pins are fully seated.

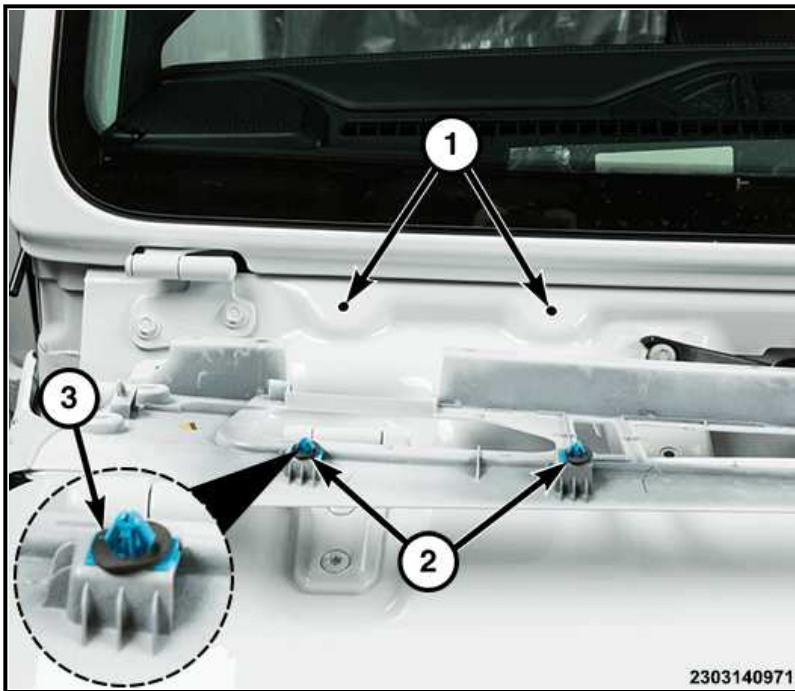
COWL/DASH BODY SIDE CORRECTIONS

Refer to [**WATER LEAK CONDITION INDEX**](#).

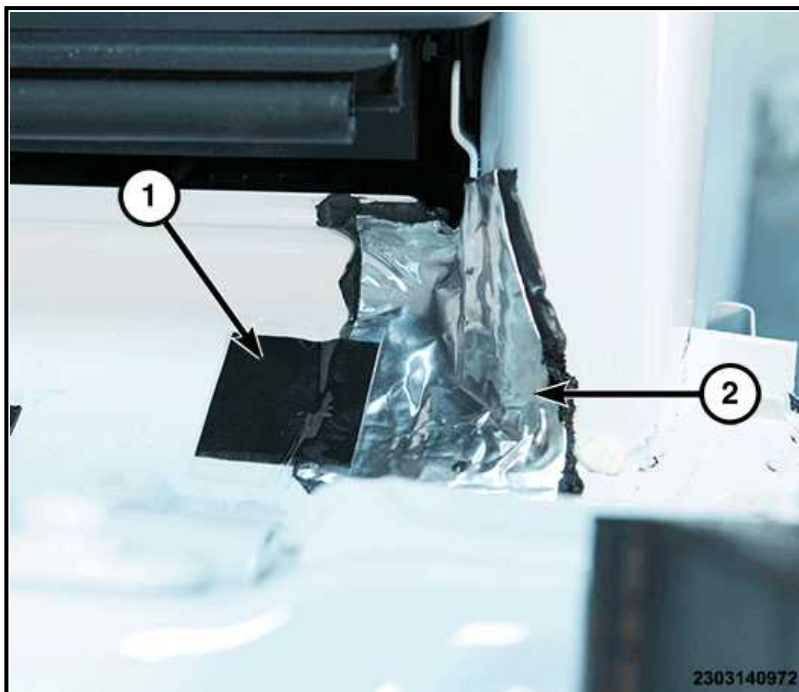
1. Mastic patch covering body hole found under door sill trim is hidden behind the wire harness. Remove trim and unbolt harness to check patch integrity.
2. Mastic patch on upper driver side inside engine compartment, partially covered by pad. There is also a twist lock plug directly beneath. Both can leak down dash wall if damaged or improperly secured.
3. Several welded studs and plates on dash wall can leak if a gap is present in the weld. Use clear sealer around stud and mastic over plates.

COWL GRILLE/PLENUM CORRECTIONS

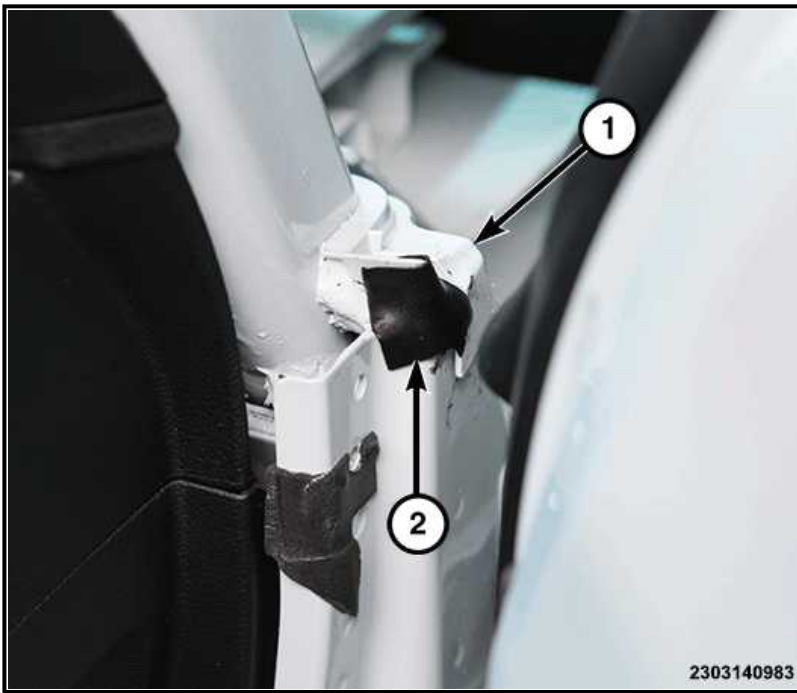
Refer to [**WATER LEAK CONDITION INDEX**](#).



1. The two outboard pins on the passenger side can allow water into the HVAC system. Verify the pins are not damaged and gasket is present and undamaged.



2. Any damage to the foil/Mylar mastic patch (2) will create a leak and must be repaired. Verify the patch (1) is not too low on the back wall of plenum and check for holes and gaps around the sport bar.

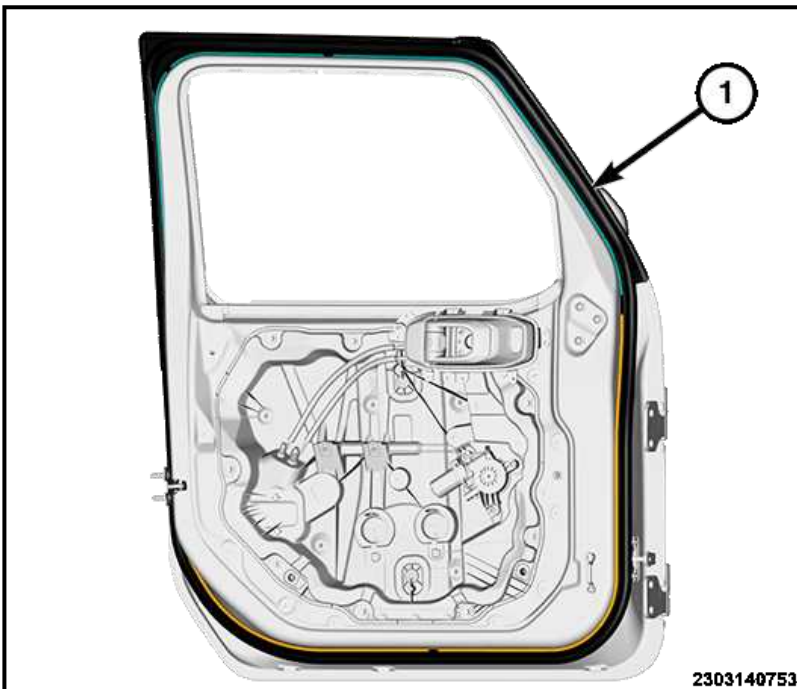


3. Check baffle cap (1) and make sure it is not damaged, broken, or off location. Replace the butyl chicklet (2) on the top side of the baffle any time the cowl seal is removed.
4. Sealer void at the plenum to dash to cowl interface. Using a paintable repair sealer Part No. 04318026AB or equivalent, repair as needed.

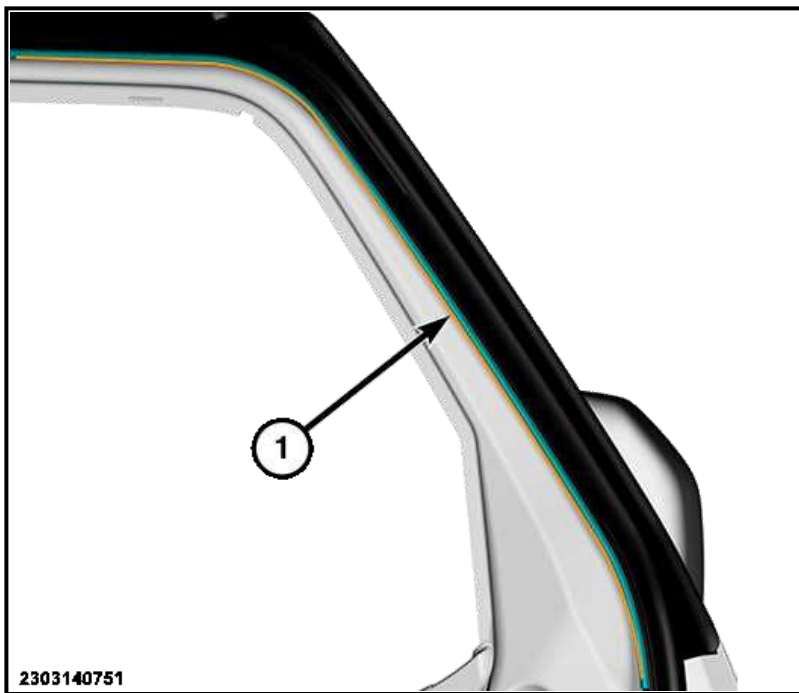
DOOR CORRECTIONS

Refer to [WATER LEAK CONDITION INDEX](#).

1. Adjust the doors to the correct locations, Refer to [GAP AND FLUSH, SPECIFICATIONS](#).



2. Verify the seal is in the proper position and all pins are properly seated.



3. Check for skips, voids, or damage in the seal retainer sealer (1) and using a paintable repair sealer Part No. 04318026AB or equivalent, repair as needed.

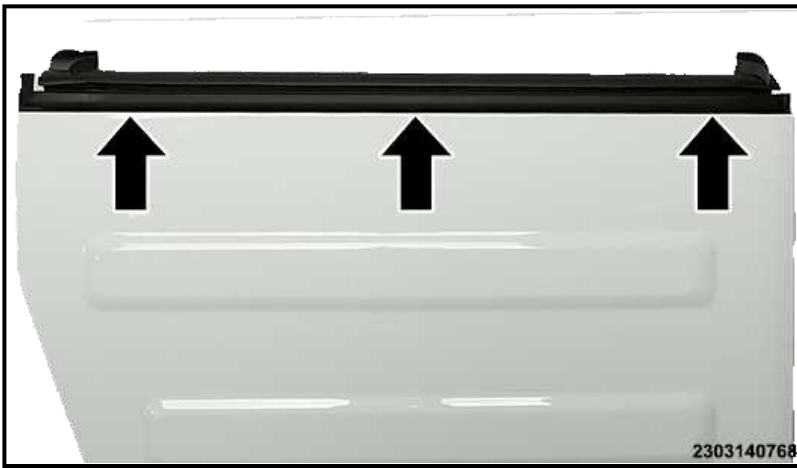


4. Verify the drain holes in bottom of seal are present and unobstructed.
5. Check to verify all the carrier plate bolts are properly tightened, Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).
6. Verify the door pad retainer clips are present and sealing properly.
7. Check wire harness push pins for damage and verify all pins are properly seated and sealed.

FREEDOM PANELS CORRECTIONS

Refer to [WATER LEAK CONDITION INDEX](#).

1. Set freedom panel gap/flush at front receivers, Refer to [REMOVABLE TOP, HARD, STANDARD PROCEDURE](#).
2. Check for missing, damaged, or off location foam, Refer to [REMOVABLE TOP, HARD, STANDARD PROCEDURE](#).



3. Verify the freedom panel center seal is not damaged and in the proper location.



4. The seal end molds will appear rotated if the seal is too far forward or rearward.

HARD TOP SEAL CORRECTIONS

Refer to [**WATER LEAK CONDITION INDEX.**](#)



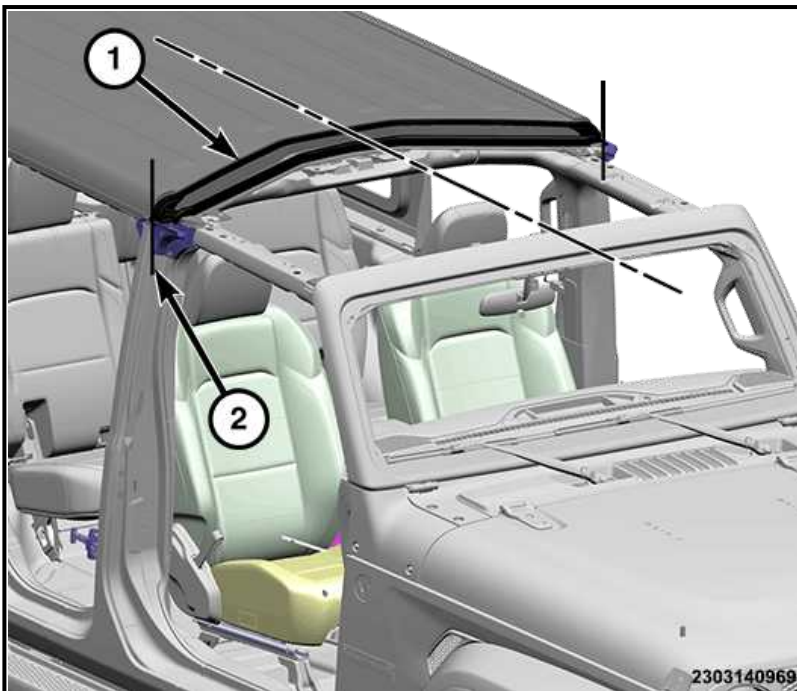
1. Check alignment of hard top header seal to center seal of freedom panel. Verify the seal is not pinched between the freedom tops.



2. Verify the center seal is flat against the header seal.



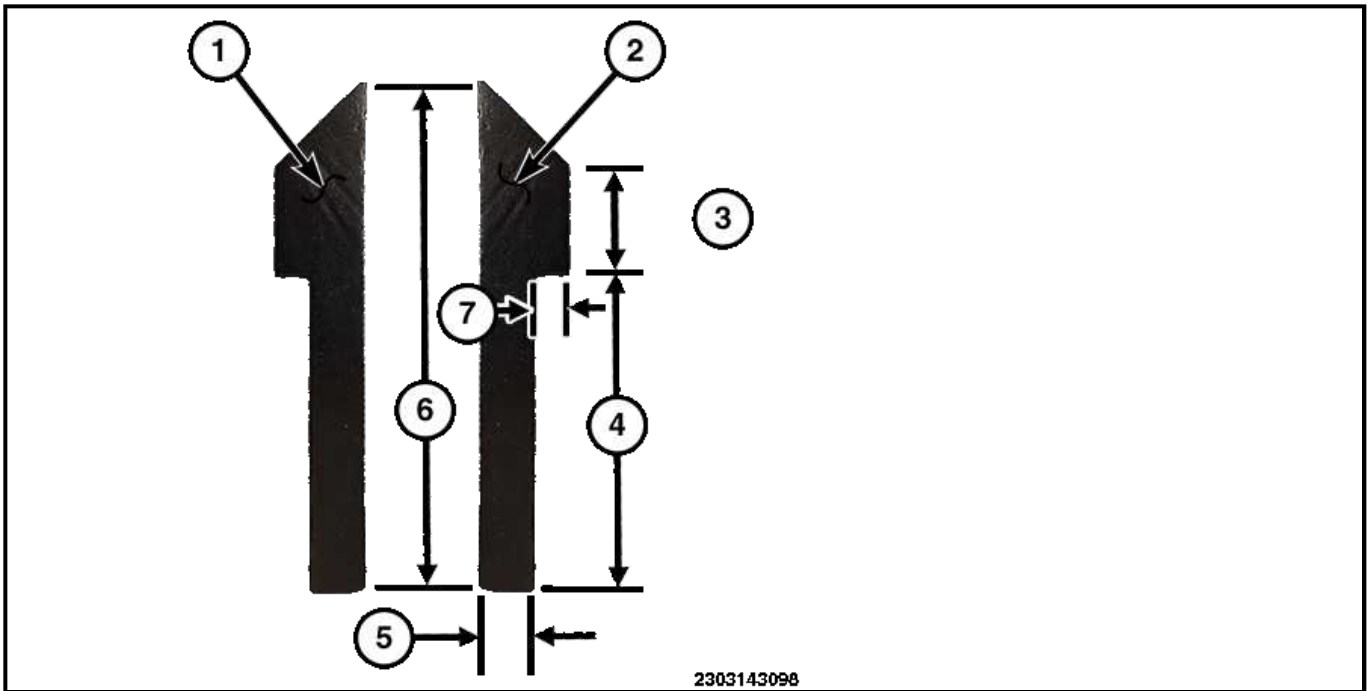
3. If B-pillar super mocket leaks from upper feathered edge or over sport bar (water in hard top bolt recess) replace butyl between hard top header seal end mold and hard top.



4. Verify seal is not off location cross car, leaving a large gap between the primary bulb of the seal and the B-pillar mocket. Finesse seal to minimize gap.

HEADER SEAL CORRECTIONS

Refer to [WATER LEAK CONDITION INDEX](#).



1. Left hand spear foam
2. Right hand spear foam
3. 30 mm (1.2 in.)
4. 85 mm (3.4 in.)
5. 15 mm (0.6 in.)
6. 140 mm (5.5 in.)
7. 10 mm (0.4 in.)

Windshield Header Foam/Butyl Replacement (change to spear foam)

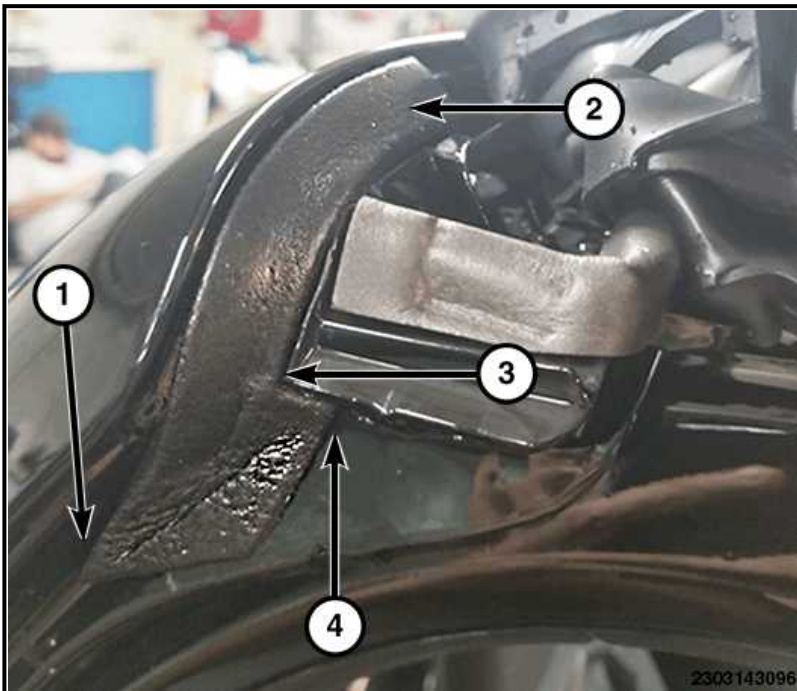
- Replaces usage of L-Foam, Butyl Chicklet, and Razer foam
- Improves manufacturability, water sealing, and wind noise capabilities
- 4 mm Ebony ESL 600 material
- Butyl backing (adhesive)
- LH and RH mirrored parts



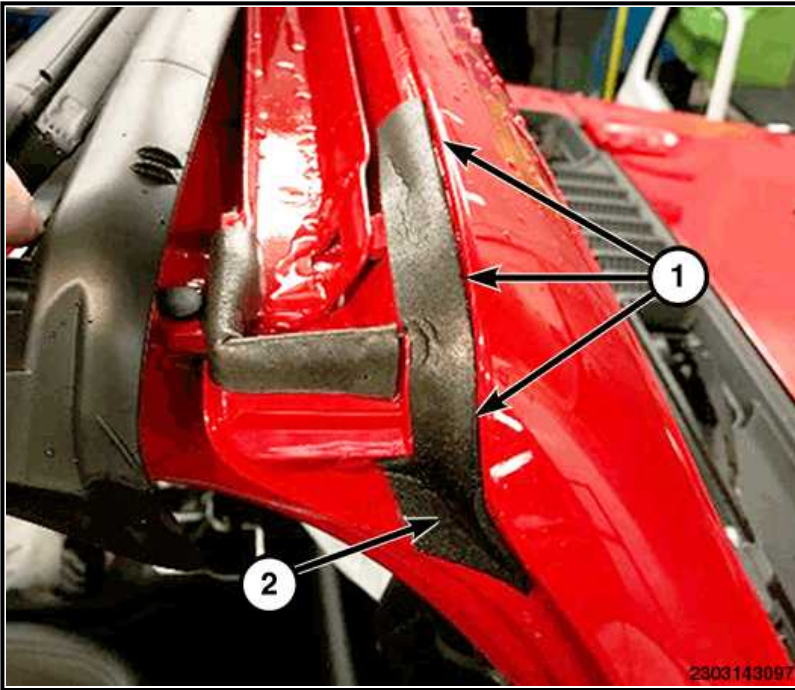
1. Using a small punch (2) or equivalent, remove the seal rivets (1) and lift the end of the seal out of the way.



2. Remove L shaped foam (1), butyl patch (2) and lower razor foam (3) and clean all surfaces fully prior to installation of the new spear foam.



3. Begin installation by placing the spear foam (2) onto the windshield frame.
 1. Start at the tip of the foam (1).
 2. Place tip into radius of windshield frame (1) as shown in illustration.
 3. Foam corner (3) sits parallel with windshield header bathtub (4).



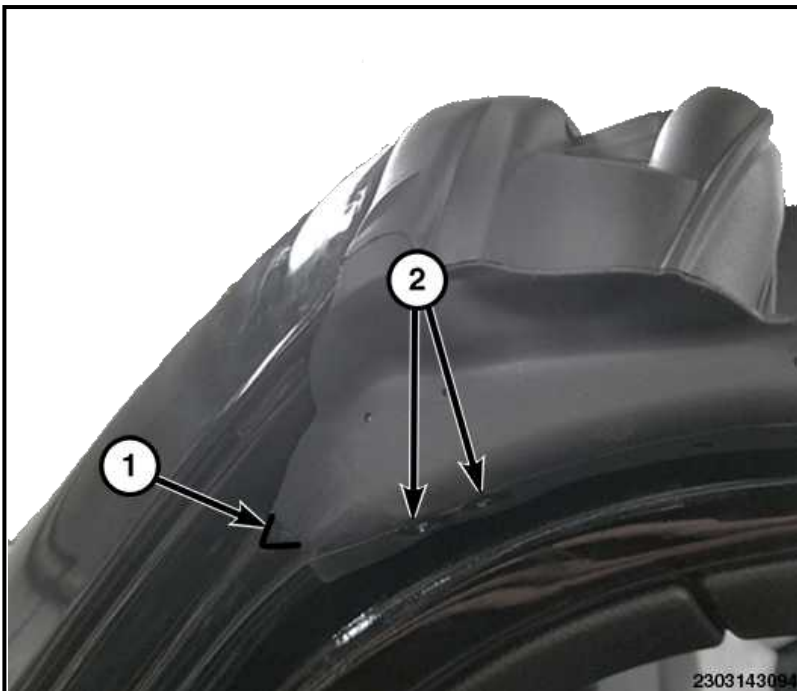
4. Seat the remaining foam around the header of the windshield frame maintaining a tight even gap to the forward edge of the frame (1).
5. Verify the foam is fully seated to windshield frame along the radius to avoid pocketing under the foam (2) that can allow water to pass.



6. Verify the header seal (1) is positioned evenly side to side (2).



7. Verify the header seal is fully seated in the windshield frame and foam (1) is not visible between frame and seal. If visible, pull end of header seal forward.

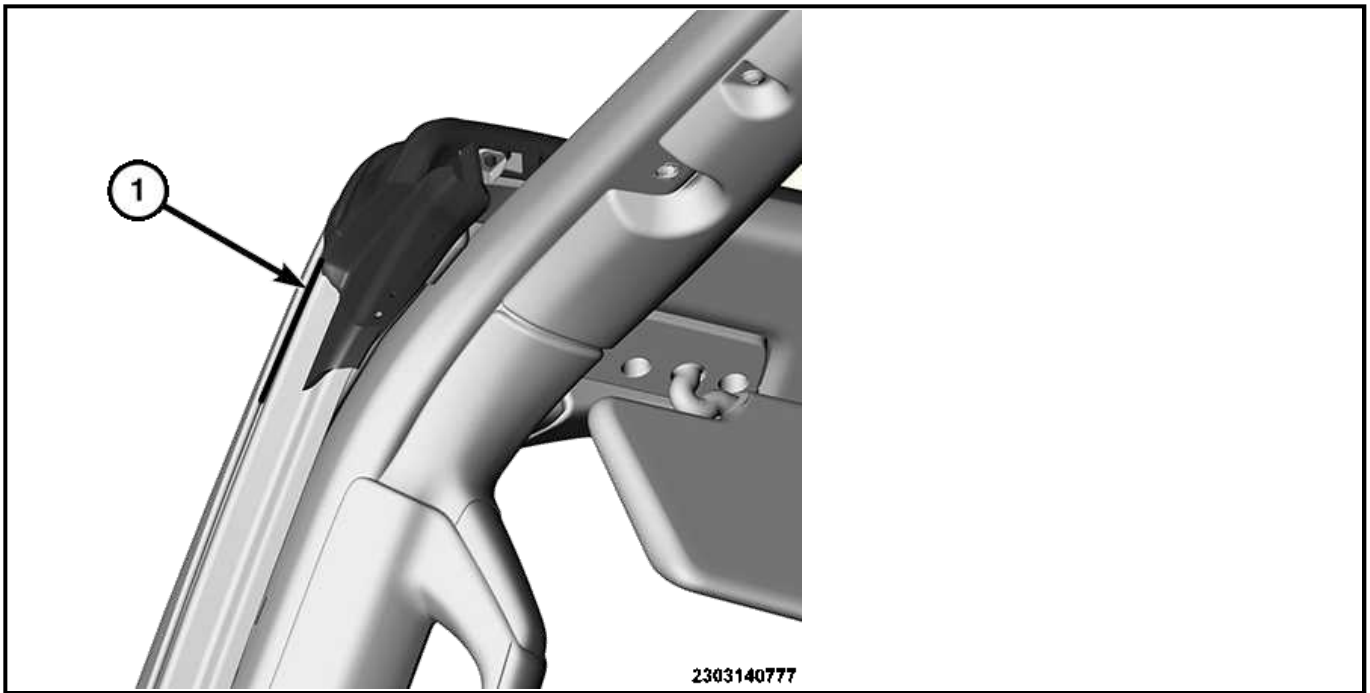


8. Install the new rivets (2).

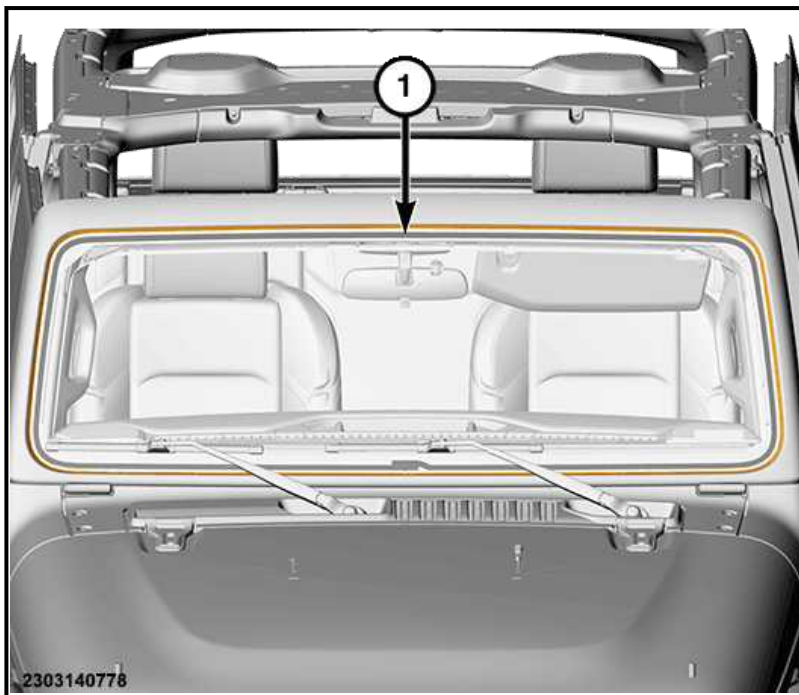
NOTE: A slight bit of the spear foam should protrude from the lower feathered edge of the seal (1) when properly installed.

WINDSHIELD FRAME CORRECTIONS

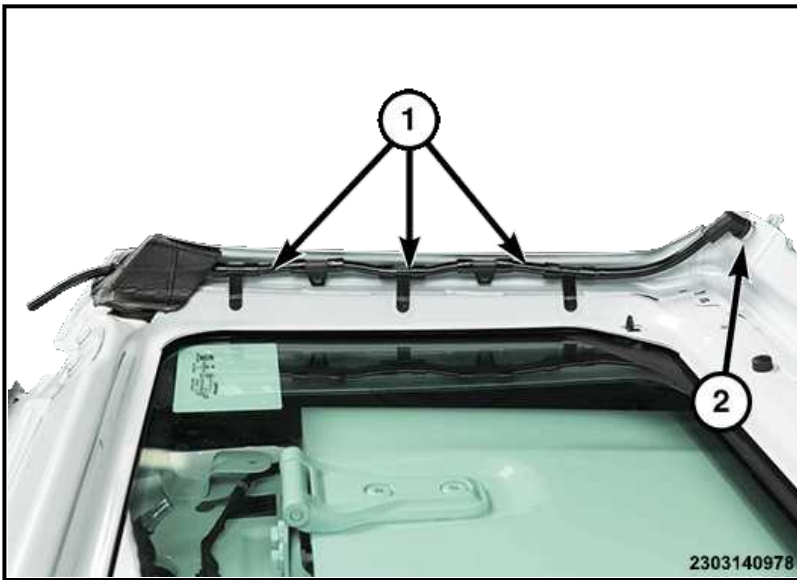
Refer to [WATER LEAK CONDITION INDEX](#).



1. Check windshield frame panel seam sealer (1) using shop air and soap test. Using a paintable repair sealer Part No. 04318026AB or equivalent, repair as needed.



2. Check windshield urethane (1) for voids or gaps using soap and air.



3. Check drain tube (1) for damage and make sure boot (2) is secured to drain trough properly.



4. Check drain trough for sealer skips or voids with water bottle test.



5. Inspect the trough end cap for sealer voids, cracks or damage.

A-PILLAR WATER LEAKS DIAGNOSIS AND TESTING VIDEO

Refer to [WATER LEAK CONDITION INDEX](#).

A-PILLAR AND COWL WATER LEAK REPAIR TIPS VIDEO

Refer to [WATER LEAK CONDITION INDEX](#).

B-PILLAR AND COWL LEAK PATHS VIDEO

Refer to [WATER LEAK CONDITION INDEX](#).

B-PILLAR AND COWL WATER LEAK REPAIR TIPS VIDEO

Refer to [WATER LEAK CONDITION INDEX](#).

SOFT TOP WATER MANAGEMENT DIAGNOSIS AND TESTING

OVERALL WATER LEAKS DIAGNOSIS AND TESTING

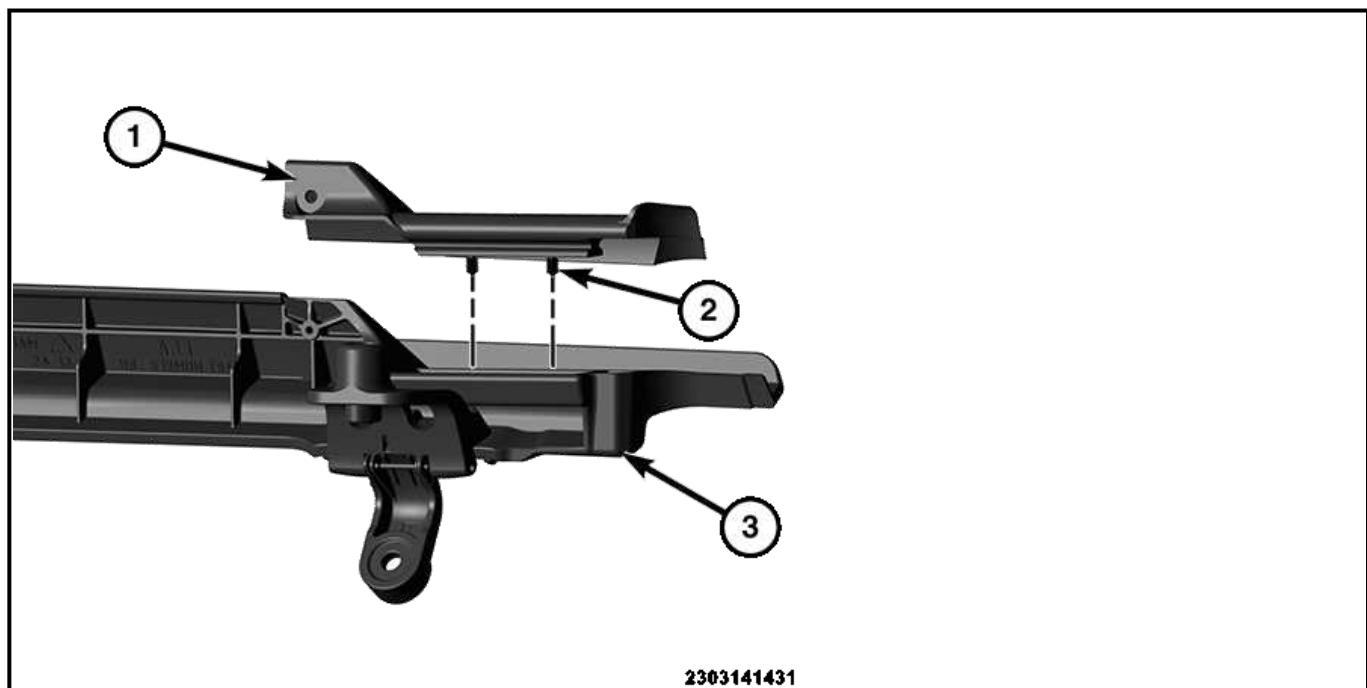
WATER LEAK CONDITION INDEX

CONDITION	POSSIBLE CAUSES	CORRECTIONS
Water on rear door trim, rear sport bar, or upper rear door rail	Top cover to door frame trough	Check for correct soft top installation and correct as needed. Refer to FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION .
	Quarter window Velcro	
	Rear door rubber extrusion seal	Refer to REAR DOOR FRAME CORRECTIONS .
Water on C-post trim, carpet, or on inboard surface of rear door rail	Rear door frame rail joint	Refer to REAR DOOR FRAME CORRECTIONS .
Water on J-rail or carpet rear of C-post	Top not latched properly	Check for correct soft top installation and correct as needed. Refer to FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION .
	Canard retainer lower foam	
	Quarter window canards	
	Quarter window Velcro	
	Top cover to door frame trough	

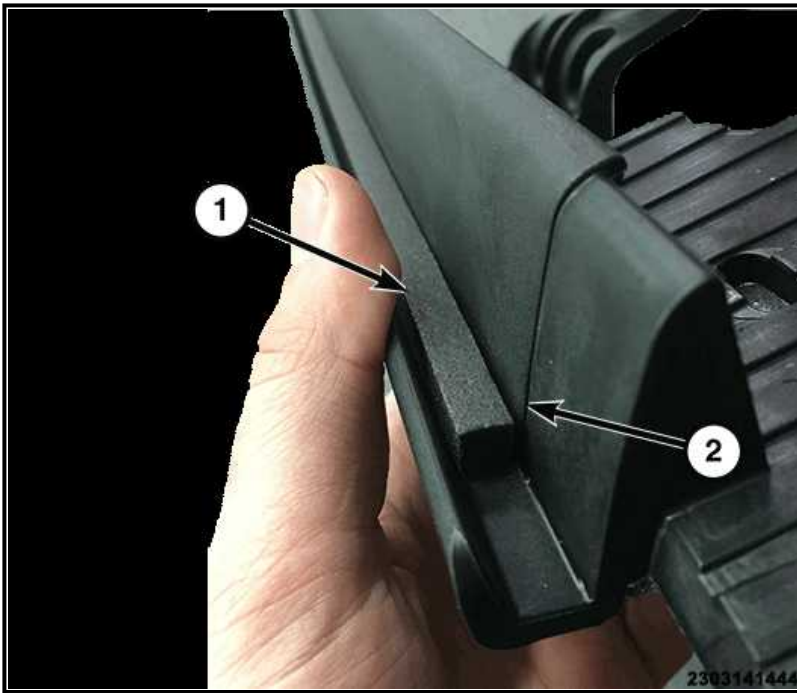
CONDITION	POSSIBLE CAUSES	CORRECTIONS
Water on front door trim, inner surface of front door rail, and inside door rail mocket trough.	Rear door frame mocket	Refer to REAR DOOR FRAME CORRECTIONS .
	C-pillar J-rail mocket	
	Front door frame mocket	Refer to FRONT DOOR FRAME CORRECTIONS .
	Header seal	Refer to HEADER SEAL CORRECTIONS .
	Windshield	Refer to WINDSHIELD FRAME CORRECTIONS .
Water on front door trim, top surface of front door rail, and top surface of sport bar.	Top not latched properly	Check for correct soft top installation and correct as needed. Refer to FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION .
	Top cover to door frame trough	
	Front door frame mocket	Refer to FRONT DOOR FRAME CORRECTIONS .
	Header bow foam	
	B-pillar mocket	
	Header seal	Refer to HEADER SEAL CORRECTIONS .
	Windshield	Refer to WINDSHIELD FRAME CORRECTIONS .
Water on front door trim, top surface of front and rear door rail, and top surface of sport bar	Top not latched properly	Check for correct soft top installation and correct as needed. Refer to FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION .
	Top cover to door frame trough	
	Quarter Window to Top Cover D-Pillar Upper	
	Door frame rails	Check door frame rails for damage and replace if needed, Refer to FRAME, DOOR FRONT, REMOVAL AND INSTALLATION FRAME, DOOR REAR, REMOVAL AND INSTALLATION .
	Front door frame rail foam	Refer to FRONT DOOR FRAME CORRECTIONS .
	B-pillar mocket	

FRONT DOOR FRAME CORRECTIONS

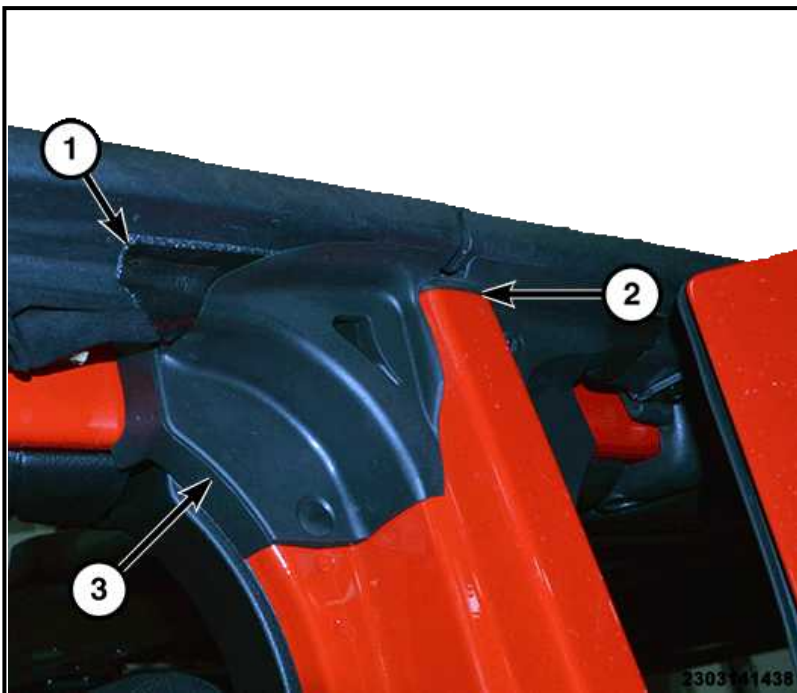
Refer to [WATER LEAK CONDITION INDEX](#).



1. Check if the A-pillar mocket (1) push pin fasteners (2) are fully engaged to door rail

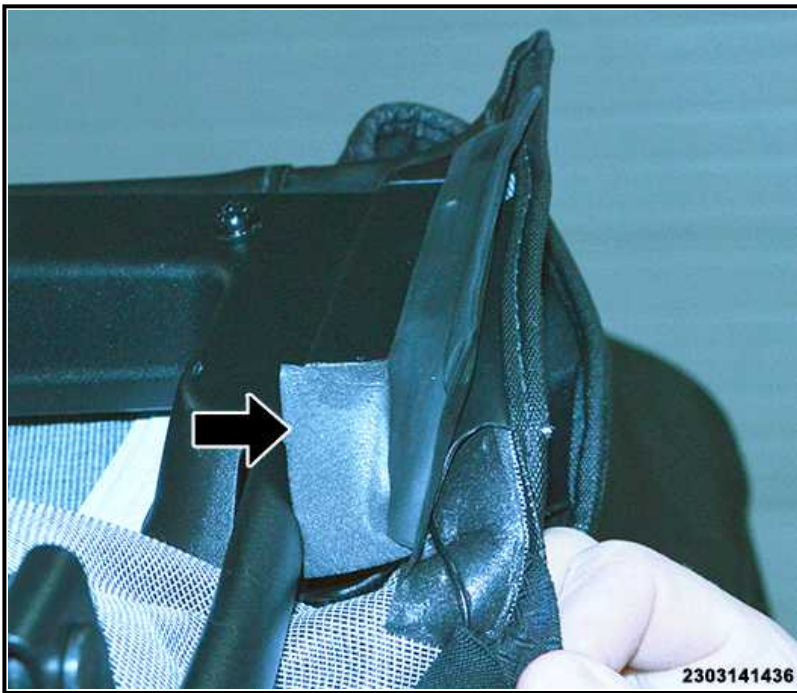


2. Check if foam (1) is attached to front door rail trough and even with the ridge (2).

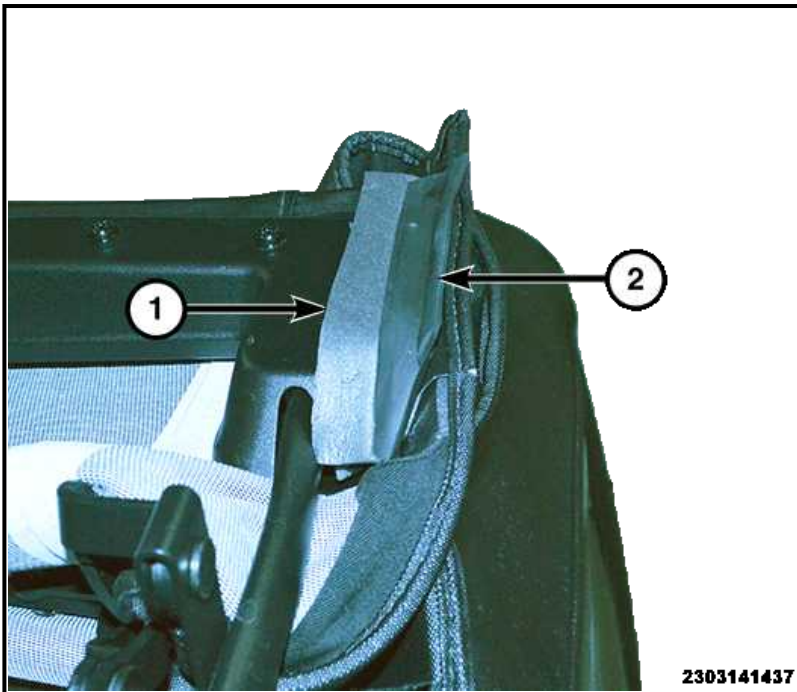


3. Check that the front door rail foam (1) is present and undamaged.

4. Check the B-pillar mocket seal (3) is installed correctly with no gap at the B-pillar (2) and seated fully up against the door rails.



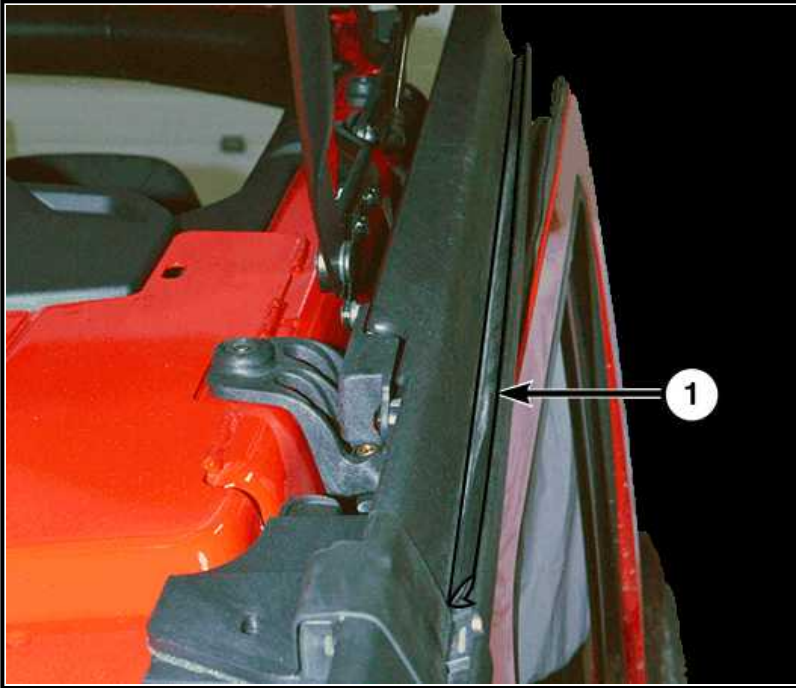
5. With the top folded back check and replace the foam seal on the header bow.



6. Slide the new foam (1) up under the fabric (2) and seat fully.

REAR DOOR FRAME CORRECTIONS

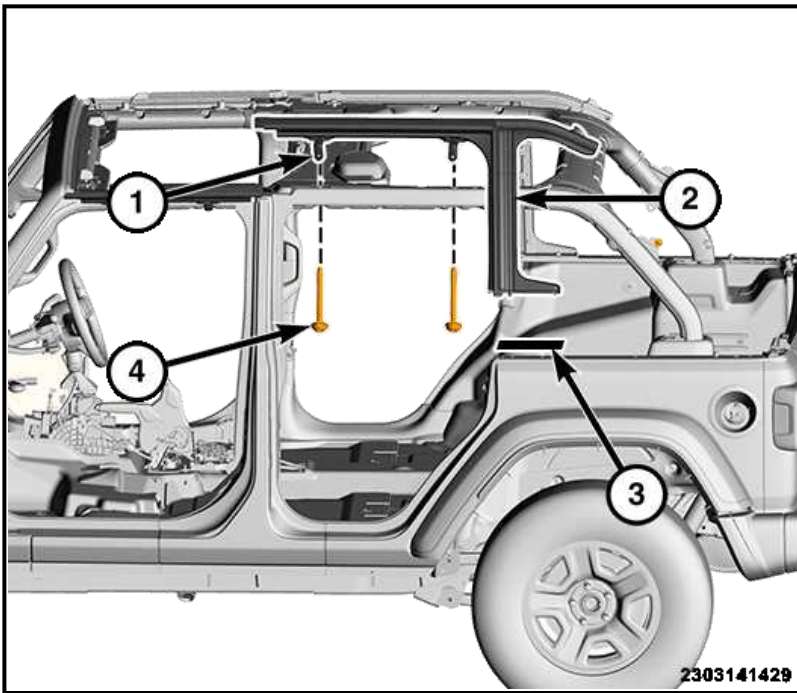
Refer to [WATER LEAK CONDITION INDEX](#).



1. Rubber extrusion seal damaged or installed incorrectly (if equipped)



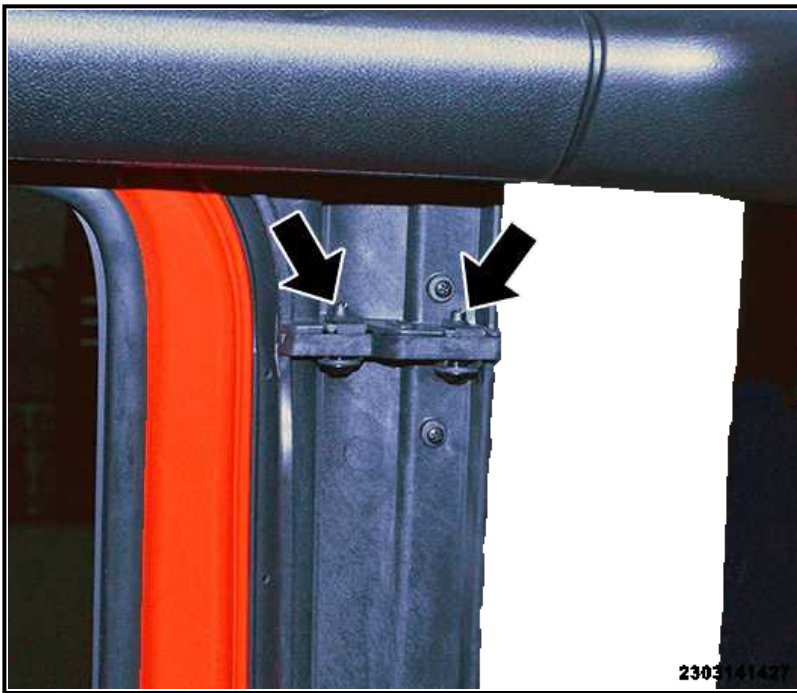
2. C-pillar J-rail Mocket Leak, replace if necessary.



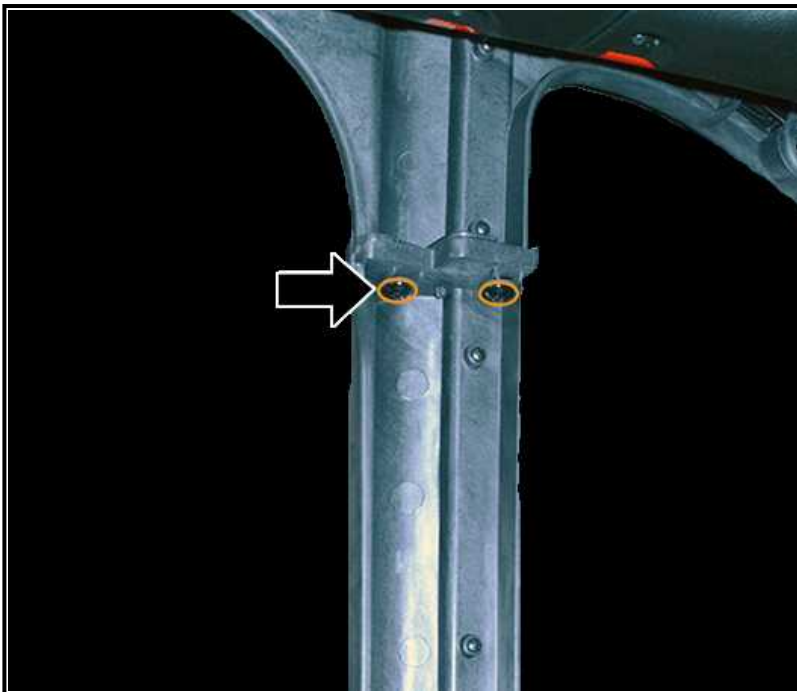
3. Remove the bolts (4), lower the brackets (1) and remove the door rail assembly (2).
4. Check the foam seal (3) is present and not damaged, replace if needed.
5. Replace the mucket seal and install the door rail (2).



6. Rear Door Frame Mucket Leak



7. Check if threads are showing from 2 vertical fasteners at rear door rail joint



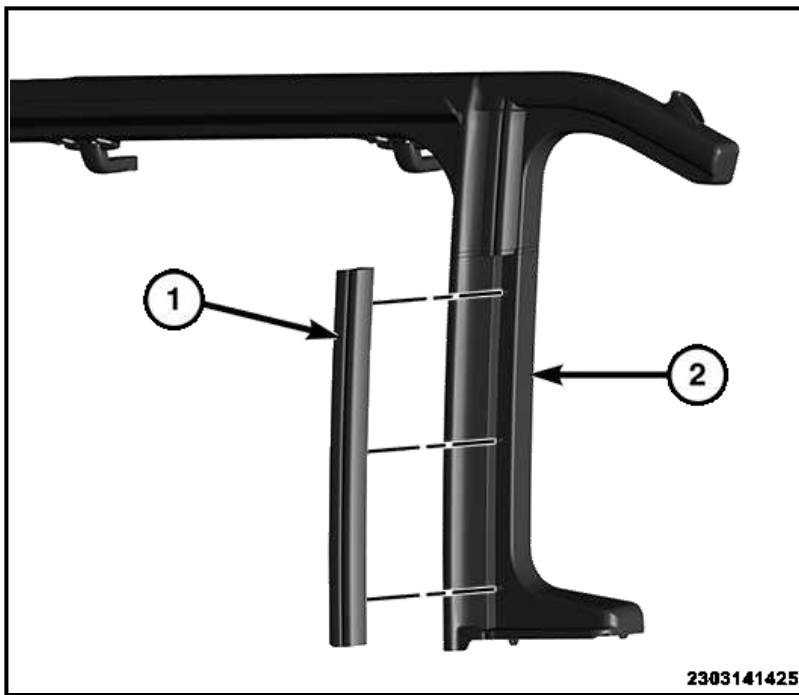
8. If threads are not showing, check for movement between upper and lower door rail and tighten the screws securely.



9. Check if foam is installed at joint shown in illustration (requires removing 3 fasteners from door rail) repair or replace as necessary.



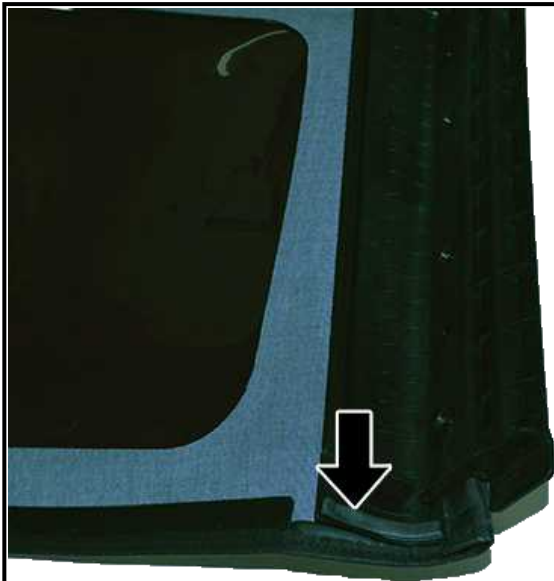
10. Remove the three J-rail retaining screws (1).



11. Remove the J-rail (1) from the door rail (2) and install new foam on the bottom before installing back.

STIFFENER FOAM CORRECTIONS

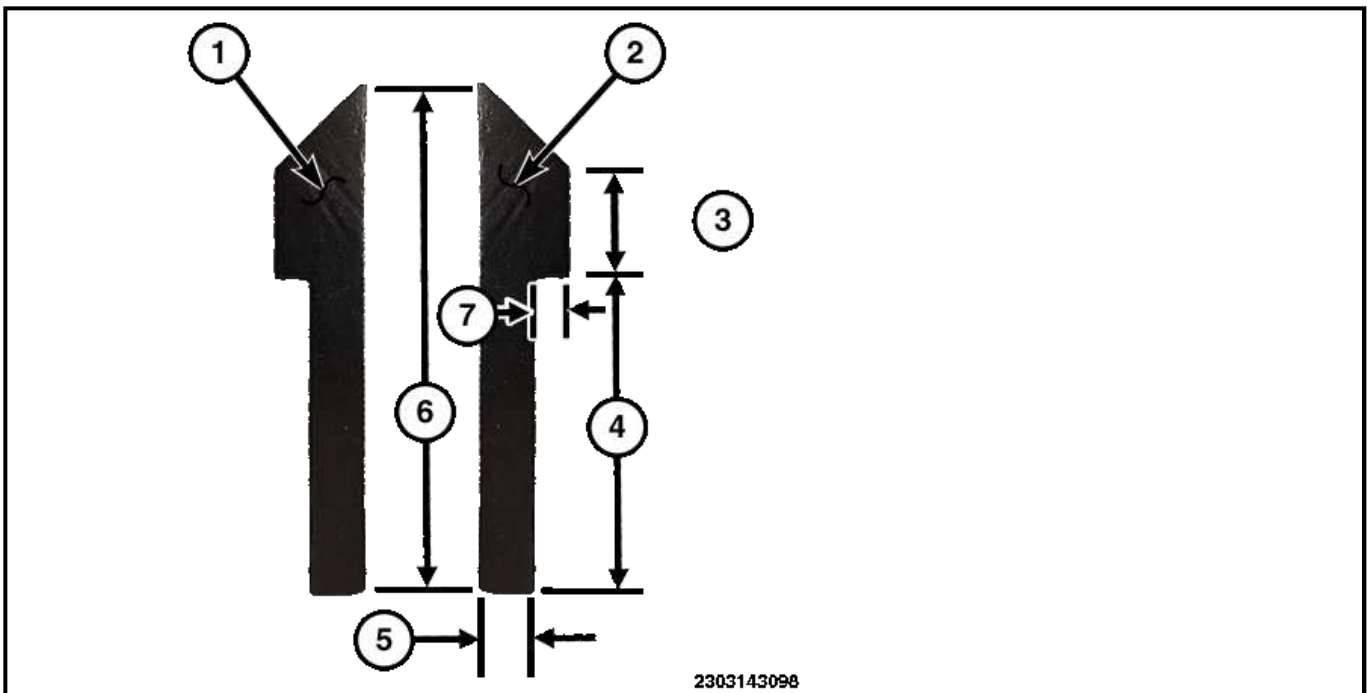
Refer to [WATER LEAK CONDITION INDEX](#).



1. If equipped, check if foam is present at bottom of rear window stiffener and replace if needed.

HEADER SEAL CORRECTIONS

Refer to [WATER LEAK CONDITION INDEX](#).



1. Left hand spear foam
2. Right hand spear foam
3. 30 mm (1.2 in)
4. 85 mm (3.4 in)
5. 15 mm (0.6 in)
6. 140 mm (5.5 in)
7. 10 mm (0.4 in)

Windshield Header Foam/Butyl Replacement (change to spear foam)

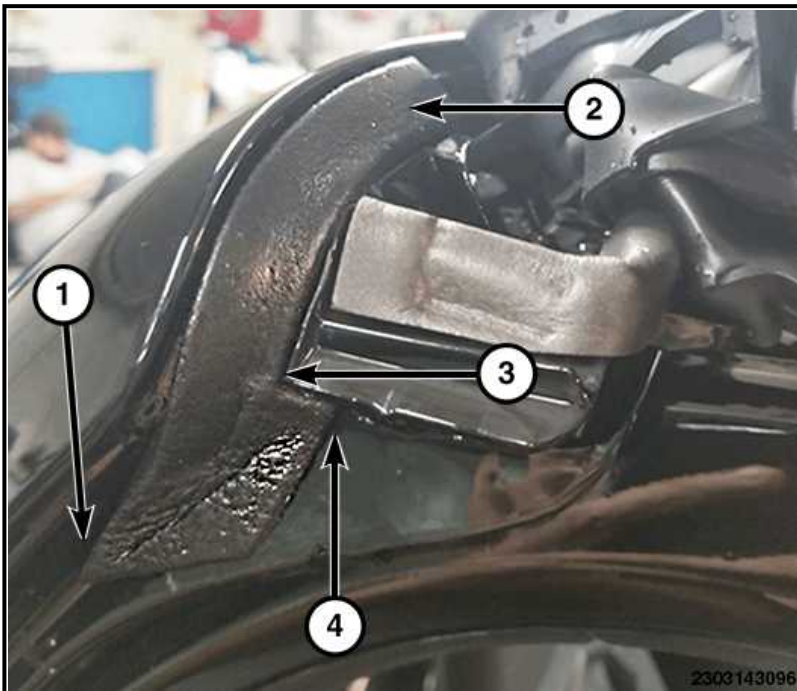
- Replaces usage of L-Foam, Butyl Chicklet, and Razer foam
- Improves manufacturability, water sealing, and wind noise capabilities
- 4 mm Ebony ESL 600 material
- Butyl backing (adhesive)
- LH and RH mirrored parts



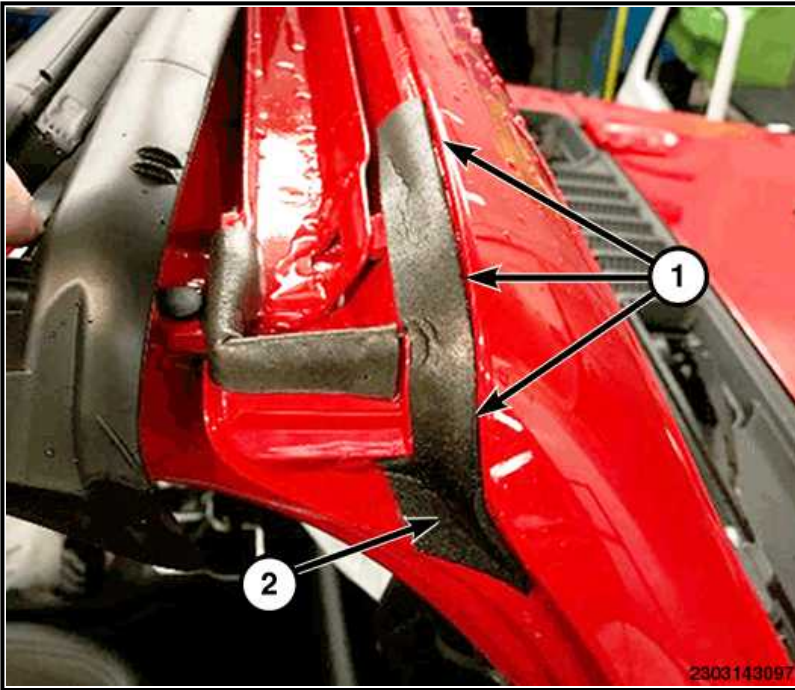
1. Using a small punch (2) or equivalent, remove the seal rivets (1) and lift the end of the seal out of the way.



2. Remove L shaped foam (1), butyl patch (2) and lower razor foam (3) and clean all surfaces fully prior to installation of the new spear foam.



3. Begin installation by placing the spear foam (2) onto the windshield frame.
 1. Start at the tip of the foam (1).
 2. Place tip into radius of windshield frame (1) as shown in illustration.
 3. Foam corner (3) sits parallel with windshield header bathtub (4).



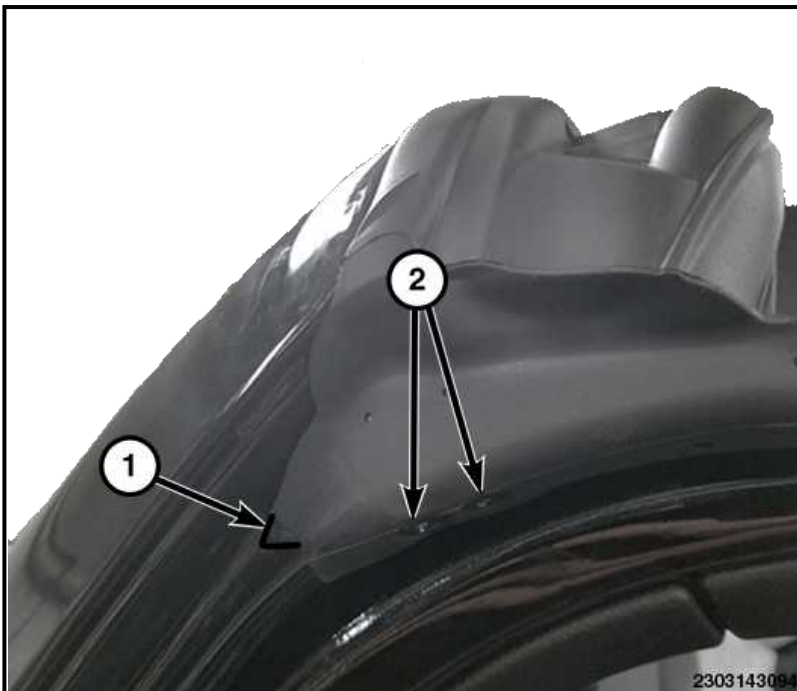
4. Seat the remaining foam around the header of the windshield frame maintaining a tight even gap to the forward edge of the frame (1).
5. Make sure foam is fully seated to windshield frame along the radius to avoid pocketing under the foam (2) that can allow water to pass.



6. Make sure header seal (1) is positioned evenly side to side (2).



7. Make sure header seal is fully seated in the windshield frame and foam (1) is not visible between frame and seal. If visible, pull end of header seal forward.

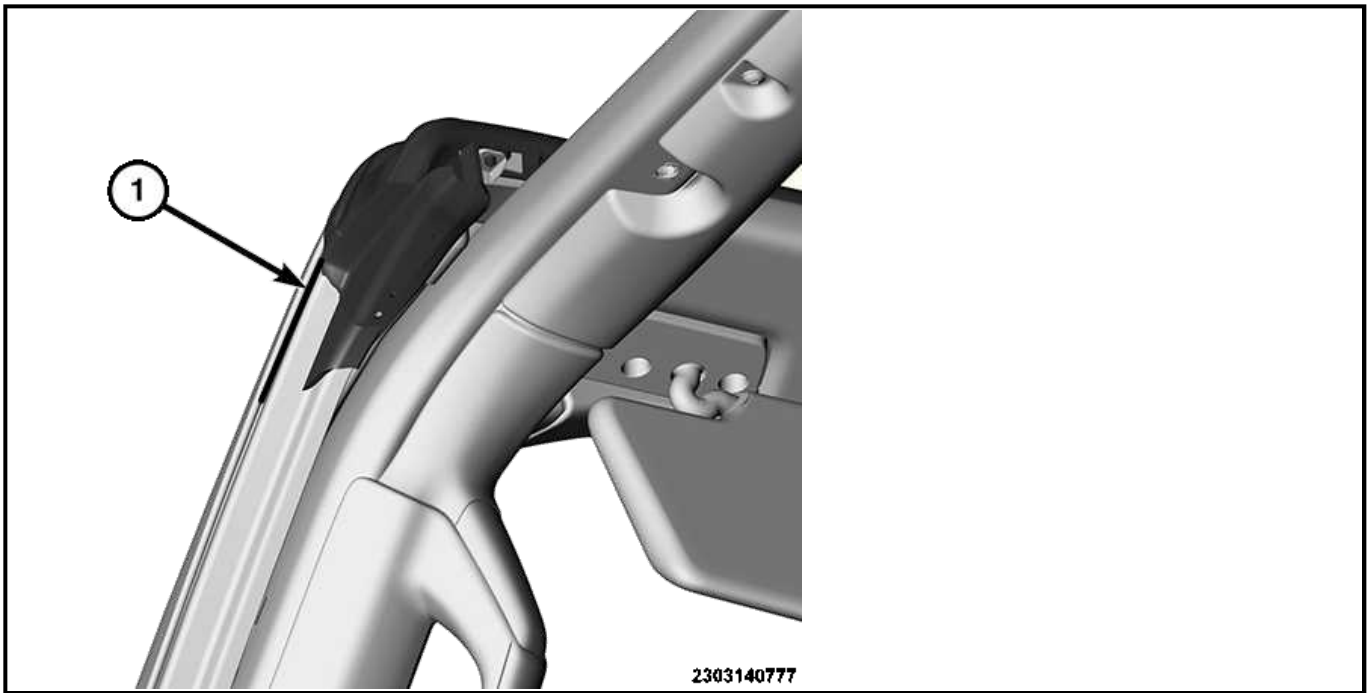


8. Install the new rivets (2).

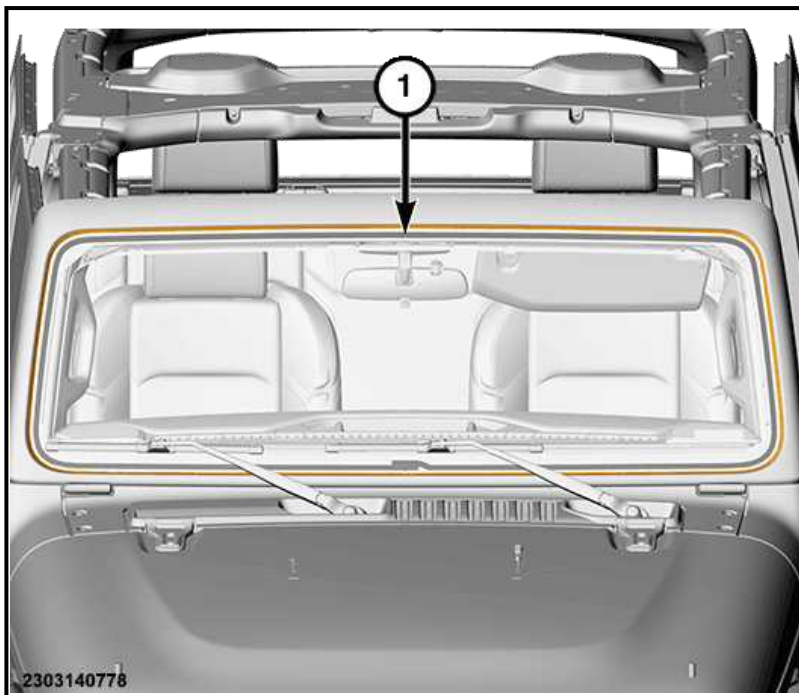
NOTE: A slight bit of the spear foam should protrude from the lower feathered edge of the seal (1) when properly installed.

WINDSHIELD FRAME CORRECTIONS

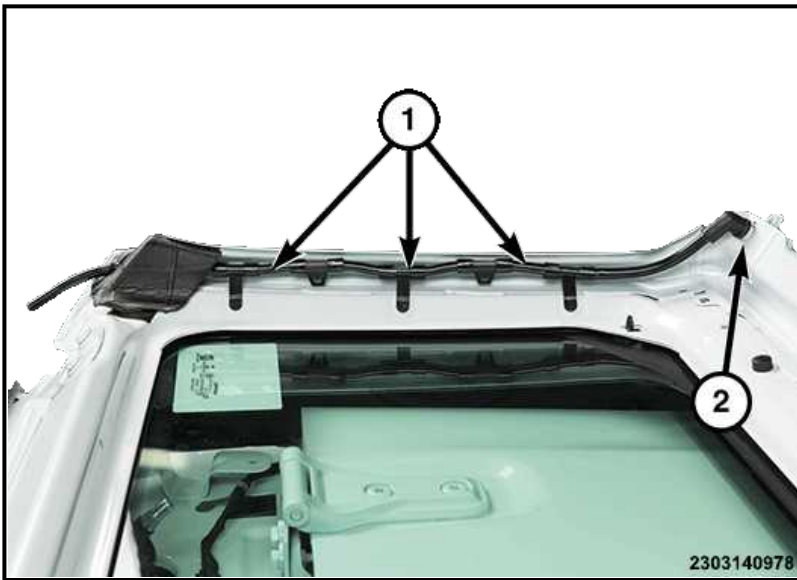
Refer to [WATER LEAK CONDITION INDEX](#).



1. Check windshield frame panel seam sealer (1) using shop air and soap test. Using a paintable repair sealer Part No. 04318026AB or equivalent, repair as needed.



2. Check windshield urethane (1) for voids or gaps using soap and air.



3. Check drain tube (1) for damage and make sure boot (2) is secured to drain trough properly.



4. Check drain trough for sealer skips or voids with water bottle test.



5. Inspect the trough end cap for sealer voids, cracks or damage.

WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross winds. Over compensating door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

1. Drive the vehicle to verify the general location of the wind noise.
2. Apply 50 mm (2.0 in.) masking tape in 150 mm (6.0 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

WIND NOISE DIAGNOSIS AND TESTING

WIND NOISE CONDITION INDEX

LOCATION	POSSIBLE CAUSES	CORRECTIONS
A-pillar	1. A-pillar	1. Refer to A-PILLAR CORRECTIONS .
B-pillar	1. B-pillar Mocket	1. Refer to B-PILLAR CORRECTIONS .
C-pillar	1. C-pillar Mocket	1. Refer to C-PILLAR CORRECTIONS .
Doors	1. Doors	1. Refer to DOOR CORRECTIONS .
Freedom panels	1. Freedom panels	1. Refer to FREEDOM PANELS CORRECTIONS .
Header seal	1. Header Seal 2. Hardtop front seal	1. Refer to HEADER SEAL CORRECTIONS . 2. Refer to HARDTOP FRONT SEAL CORRECTIONS .
Windshield	1. Windshield Frame	1. Refer to WINDSHIELD CORRECTIONS .

A-PILLAR CORRECTIONS

Refer to [WIND NOISE CONDITION INDEX](#).



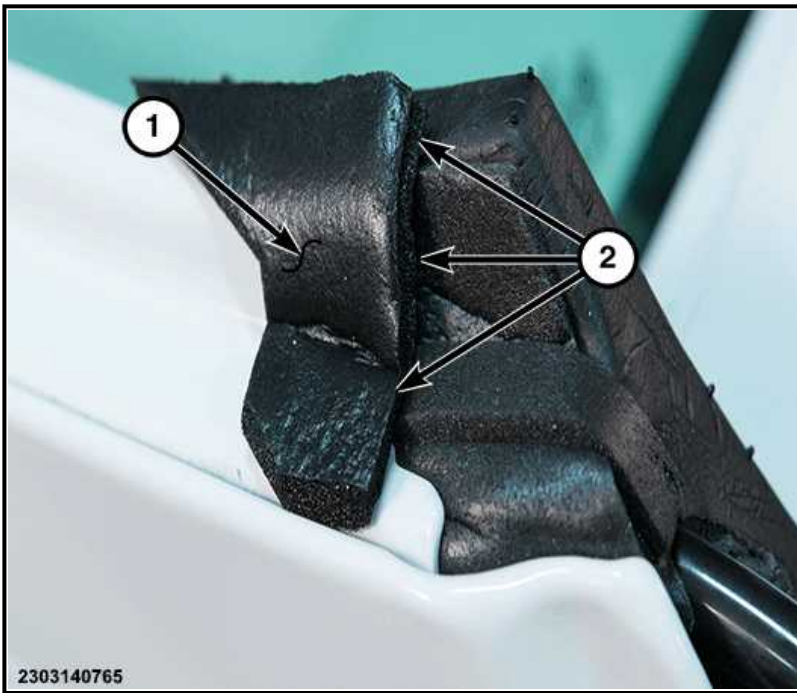
1. Lower A-pillar - Check the front door cut line lip at the beltline for rolling over when closing door. Replace seal if damaged or deformed.



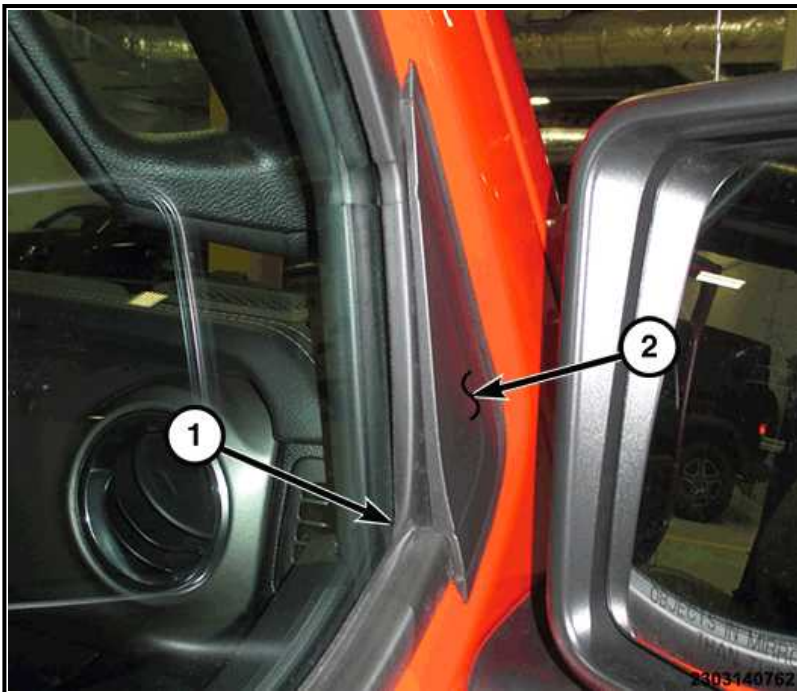
2. Lower A-pillar - Verify steeple foam at lower A-pillar is hiding frame metal and contacting drain tube foam 2-3 mm overlap beyond metal edge.



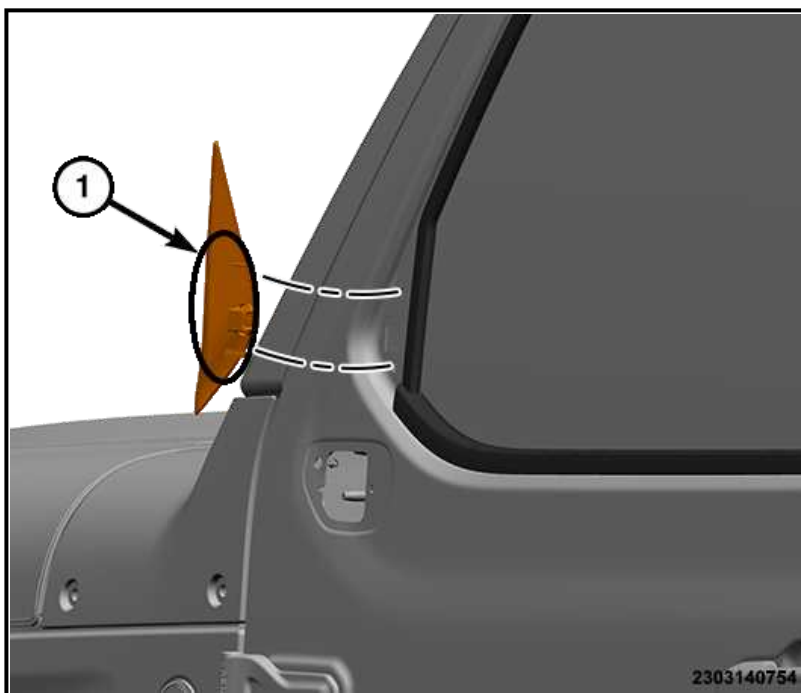
3. With the windshield frame lowered no metal should be visible between the foam.



4. The upper foam (1) should sit flush against the lower foam (2) and seal against the frame fully.



5. Lower A-pillar - Check front door flag applique (2) is fully seated to body and outer glass seal. Verify the glass seal and outer belt molding are not pinching each other together (1).



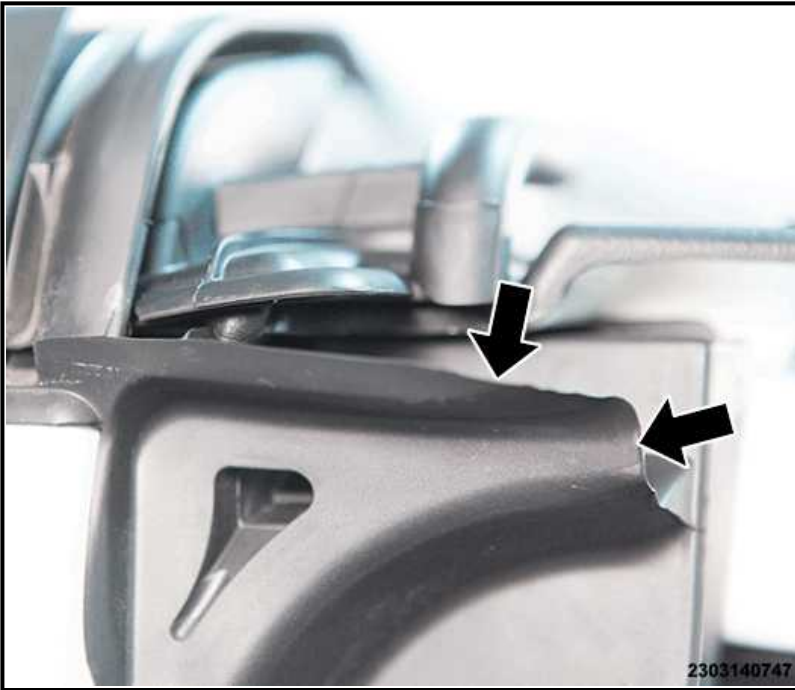
6. Remove and apply foam tape on inner side of applique (1) and reinstall.

B-PILLAR CORRECTIONS

Refer to [WIND NOISE CONDITION INDEX](#).



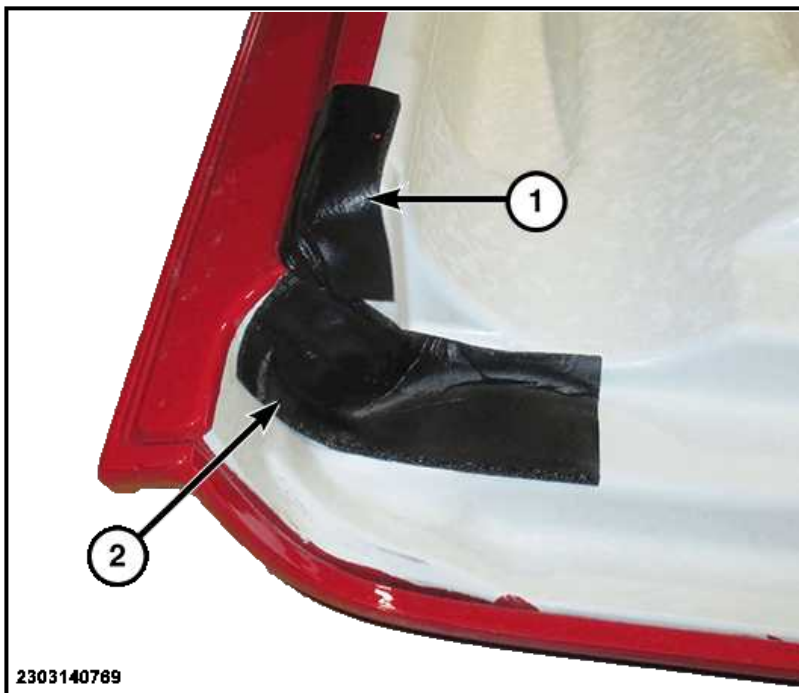
1. Upper B-pillar - Verify super mocket is not sitting too far outboard on the B-pillar. Press in with top fully secured to address this issue.



2. Upper B-pillar - Verify the feathered edge of the super mocket is not rolled underneath the panel or damaged.



3. Verify the push pins are fully seated to prevent super mocket from traveling off position.



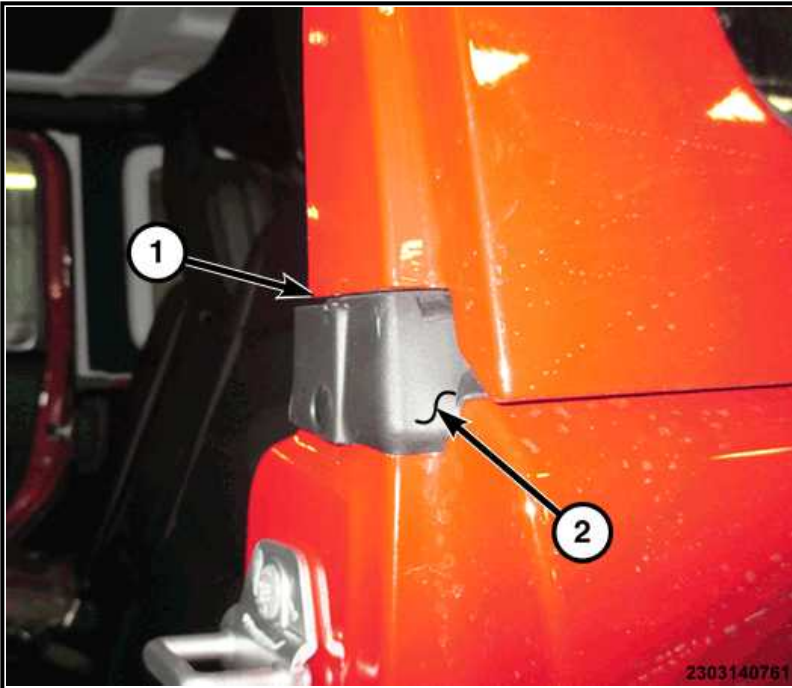
4. Verify the rear outboard freedom panel foam is in correct location, the lower foam (1) is overlapping foam (2) and sealing to mocket.



5. Check that the interior foam above the B-pillar is present and sealed fully to the top.

C-PILLAR CORRECTIONS

Refer to [WIND NOISE CONDITION INDEX](#).

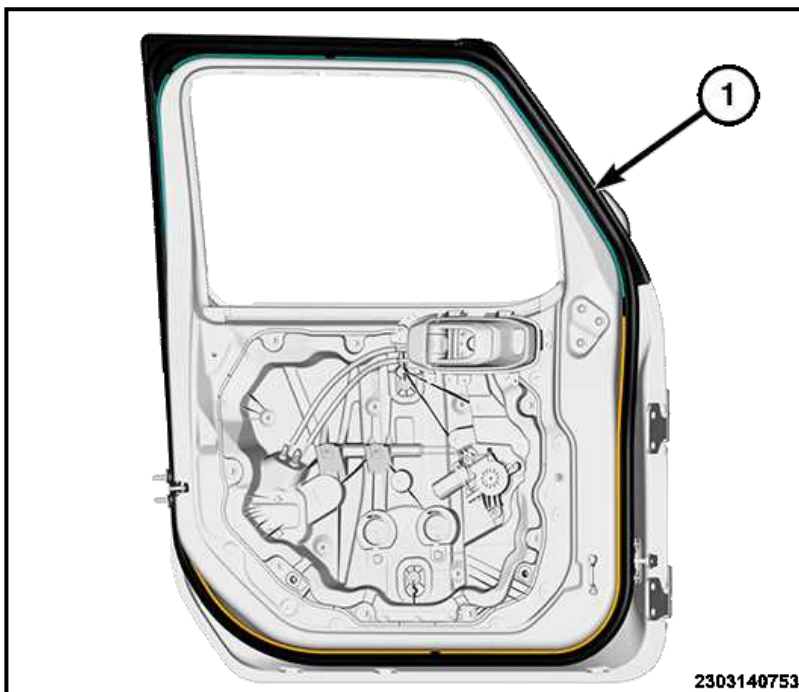


1. Verify C-pillar mocket (2) is in proper position at beltline. Replace if damaged or deformed.
2. Lower C-pillar - Verify there is no gap where C-pillar mocket interfaces with top (1). If a gap exists, raise the top and add foam tape to fill void.

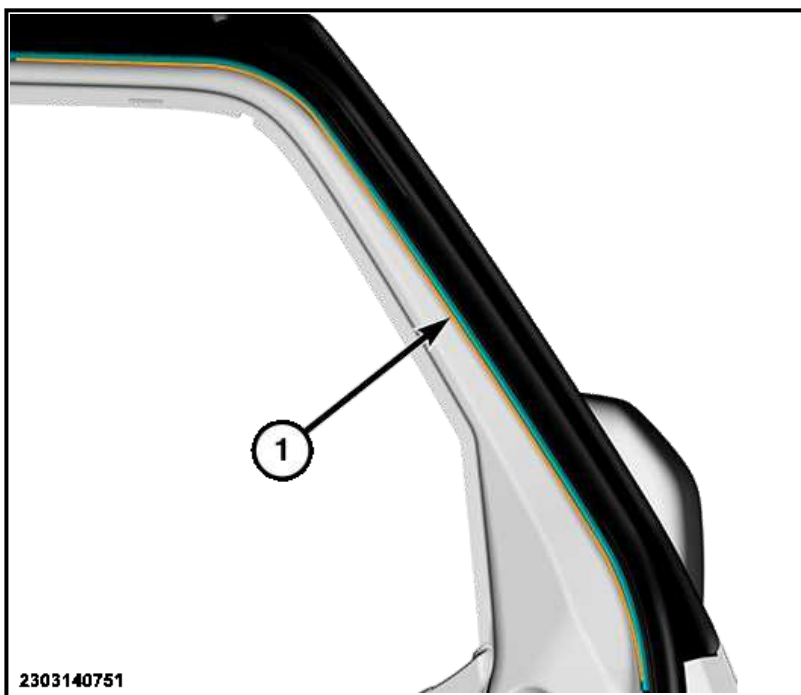
DOOR CORRECTIONS

Refer to [WIND NOISE CONDITION INDEX](#).

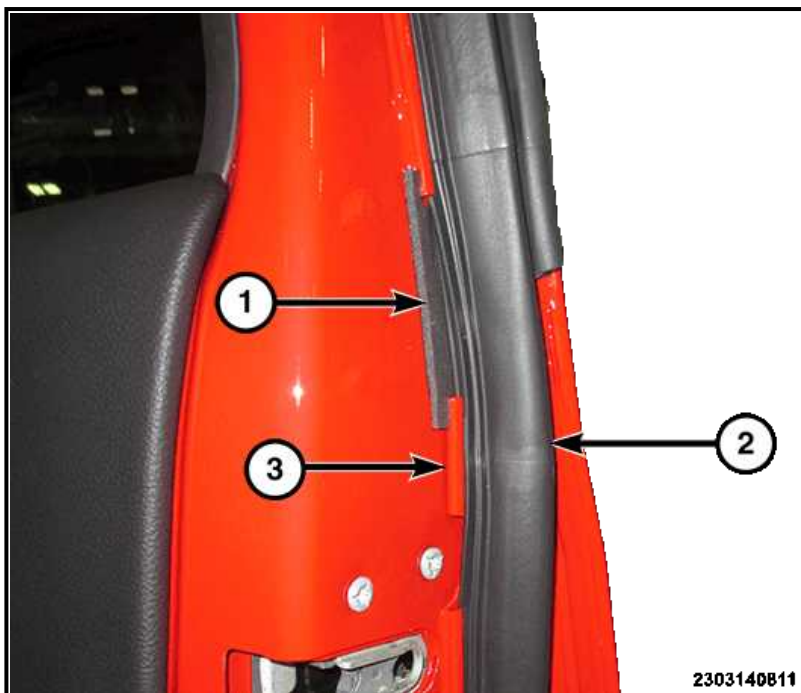
1. Adjust the doors to the correct locations, Refer to [GAP AND FLUSH, SPECIFICATIONS](#).



2. Verify the door seal (1) is in the proper position and all pins are properly seated.



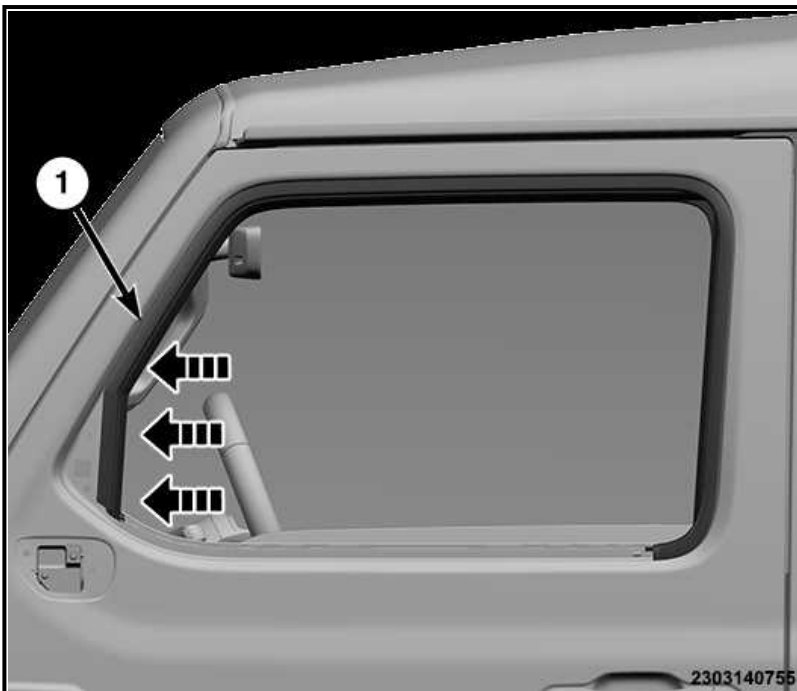
3. Check for skips, voids, or damage in the seal retainer sealer (1) and using a paintable repair sealer Part No. 04318026AB or equivalent, repair as needed.



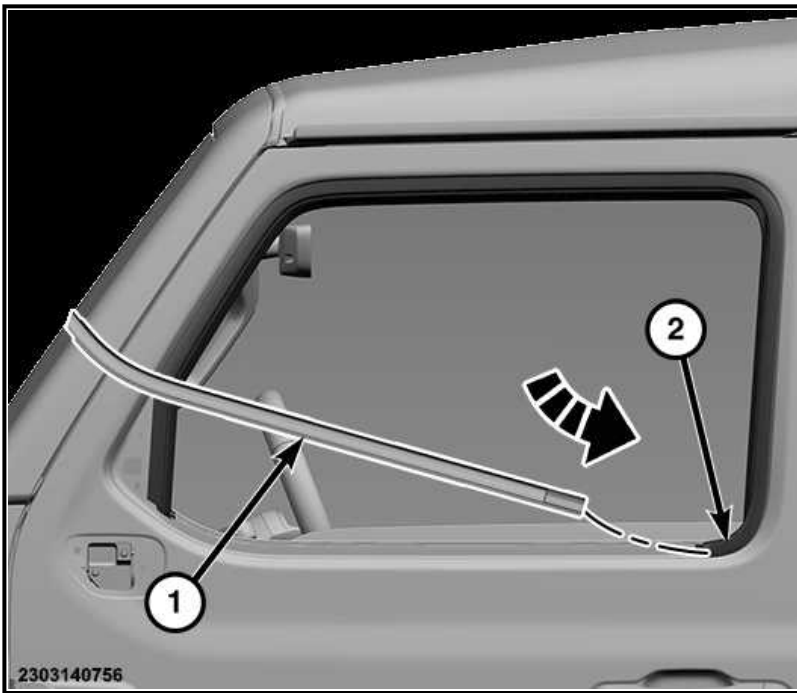
4. Make sure retainer gap foam is present and in good condition and the door seal (2) is seated into the retainers (3) fully.



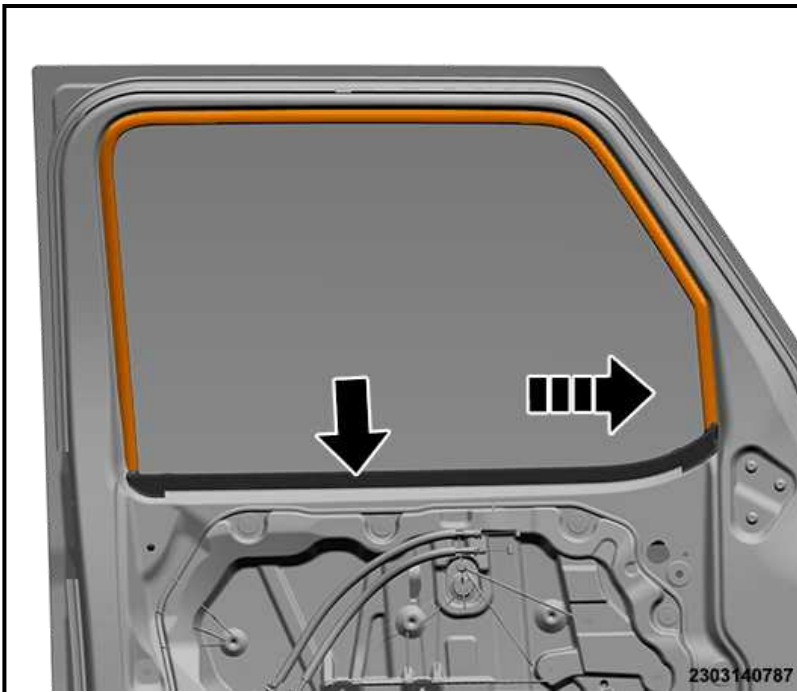
5. Lower A-pillar - Check the front door cut line lip at the beltline for rolling over when closing door. Replace seal if damaged or deformed.



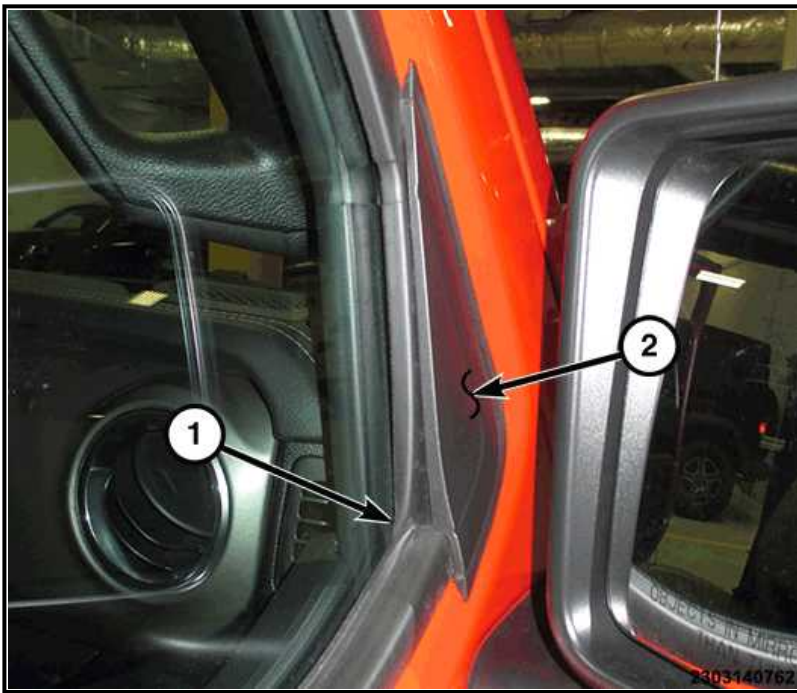
6. Verify outer door glass seal (1) is fully seated to door glass flange.



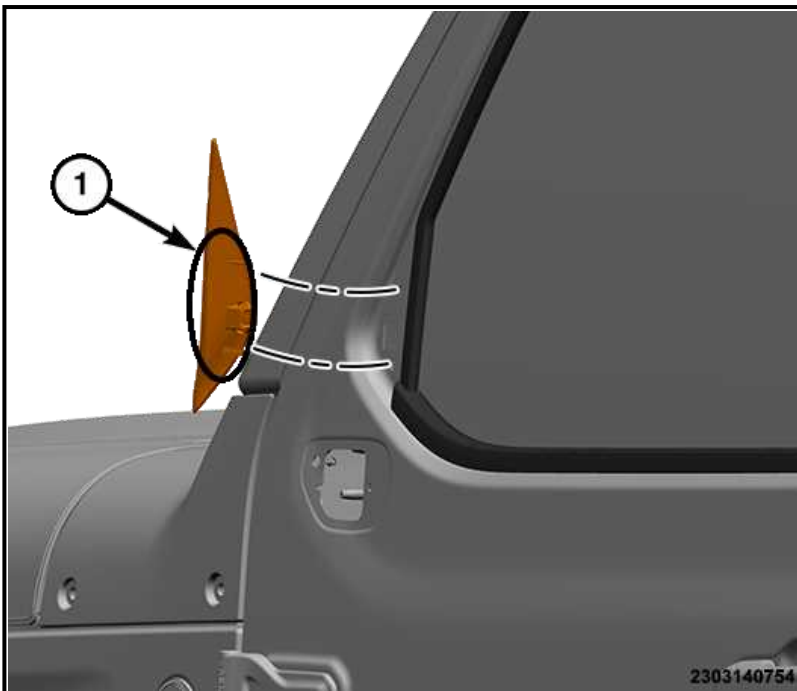
7. Verify outer belt seal (1) is pushed back against the seal (2) and seated fully.



8. Check front door inner belt molding fits tight to the front weatherstrip channel - Reposition belt molding forward or replace inner belt molding.



9. Check front door flag applique (2) is fully seated to body and outer glass seal. Verify the glass seal and outer belt molding are not pinching each other together (1).

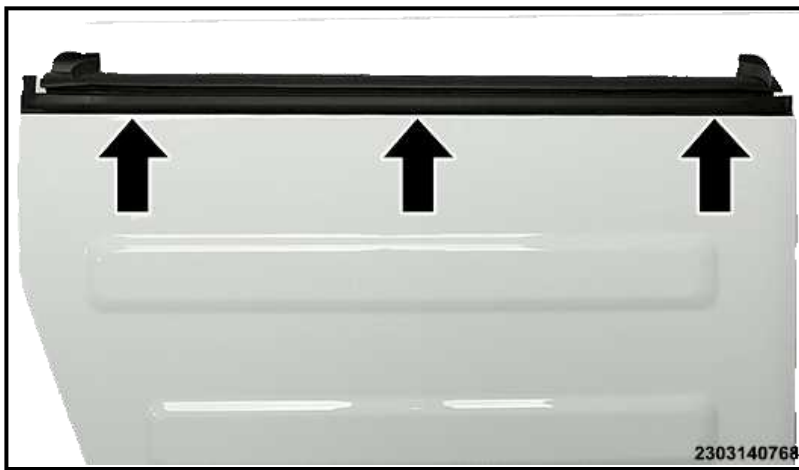


10. Remove and apply foam tape on inner side of applique (1) and reinstall.

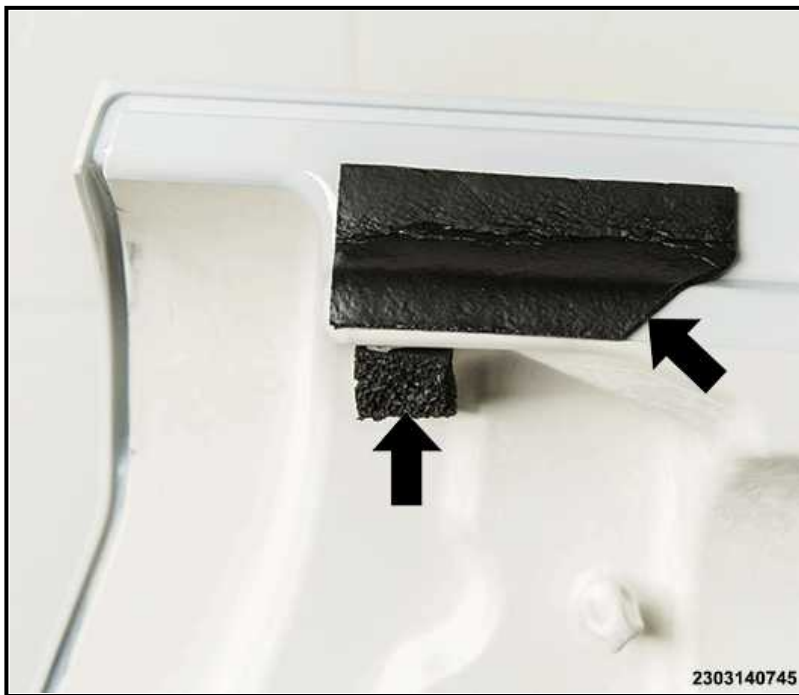
FREEDOM PANELS CORRECTIONS

Refer to [WIND NOISE CONDITION INDEX](#).

1. Set freedom panel gap/flush at front receivers, Refer to [REMOVABLE TOP, HARD, STANDARD PROCEDURE](#).



2. Verify the freedom panel center seal is not damaged and in the proper location. The seal end molds will appear rotated if the seal is too far forward or rearward.



3. Check for missing, damaged, or off location foam, Refer to [**REMOVABLE TOP, HARD, STANDARD PROCEDURE**](#) .

HARDTOP FRONT SEAL CORRECTIONS

Refer to [**WIND NOISE CONDITION INDEX**](#).



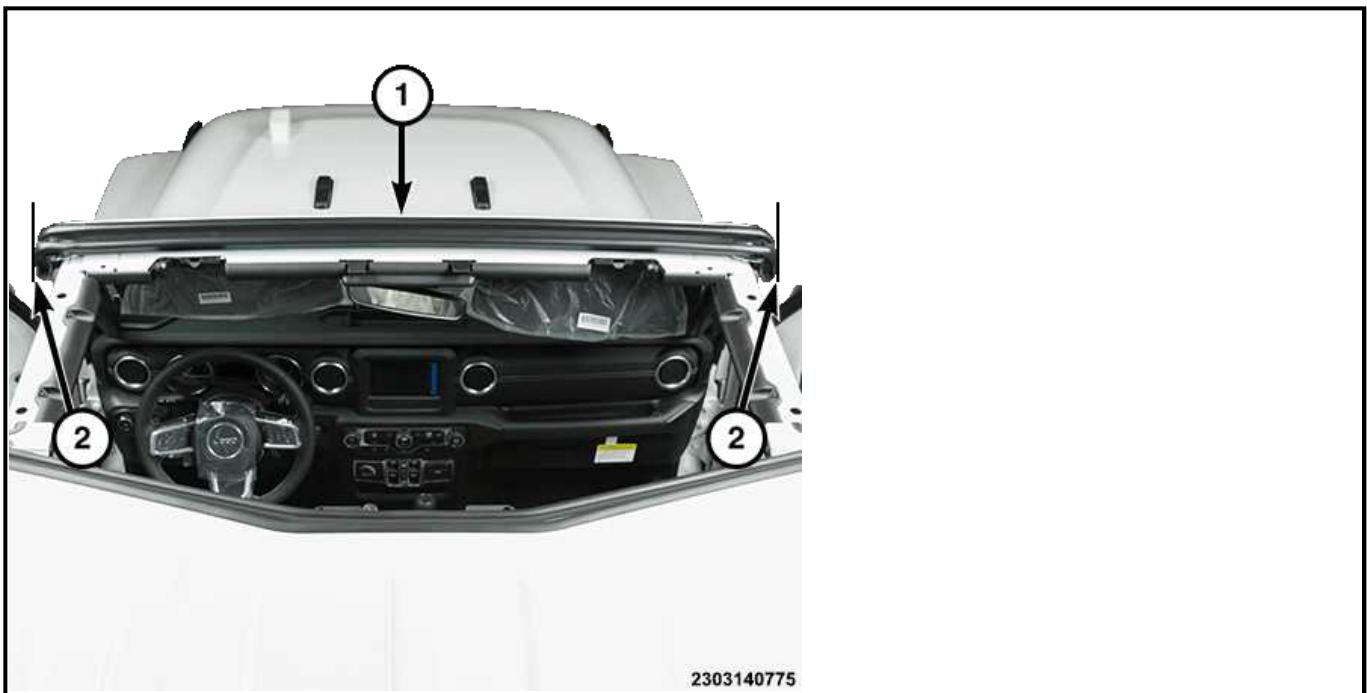
1. Check alignment of hard top header seal to center seal of freedom panel. Verify the seal is not pinched between the freedom tops.



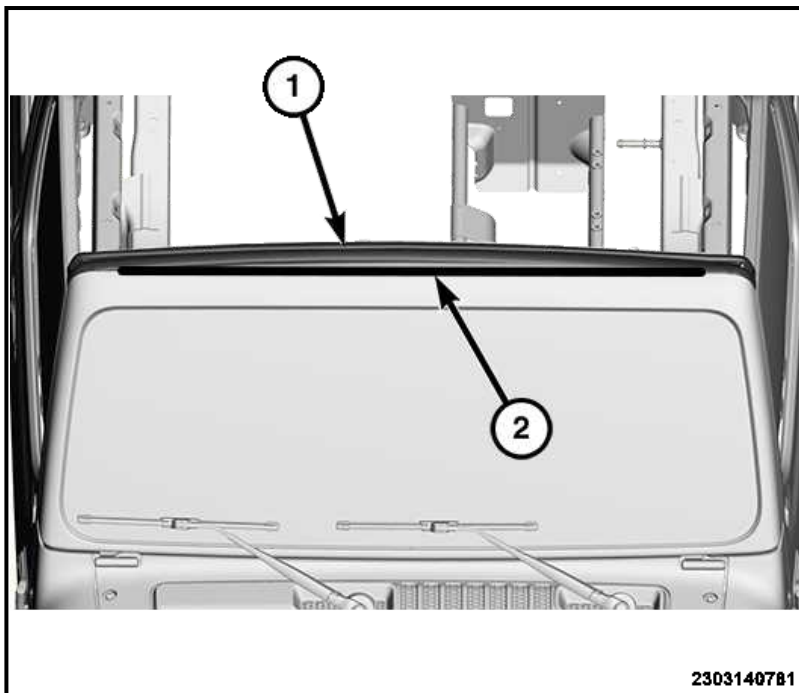
2. Verify the center seal is flat against the header seal.

HEADER SEAL CORRECTIONS

Refer to [**WIND NOISE CONDITION INDEX**](#).



1. Verify header seal (1) is positioned evenly side to side (2).



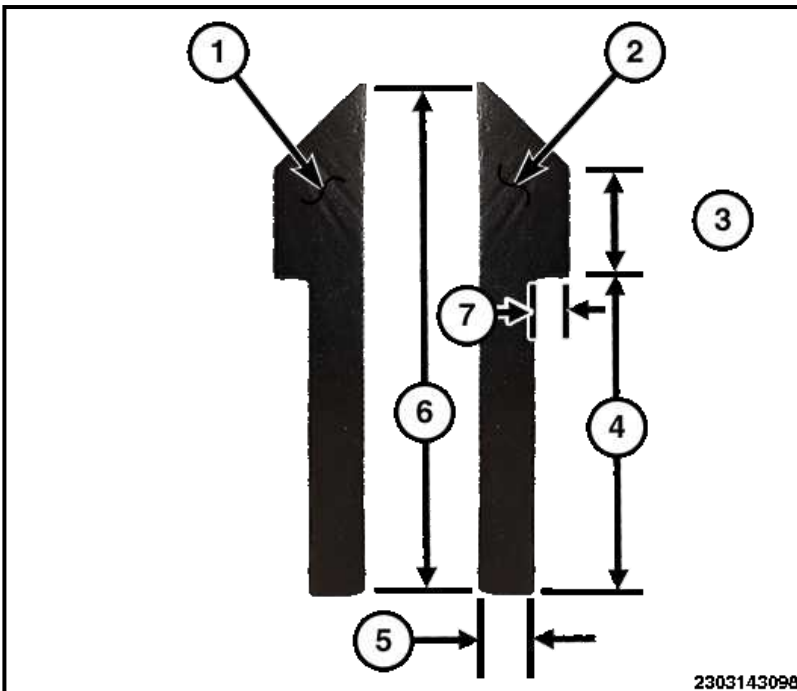
2. Using black RTV (2), seal the front edge of the header seal (1) to the windshield frame.

NOTE:

The RTV needs to be smoothed down so that it does not pucker and push against the header seal, needs to be applied consistently across the entire frame top and smoothed with a finger. Make sure that no RTV gets onto the exterior painted surface.



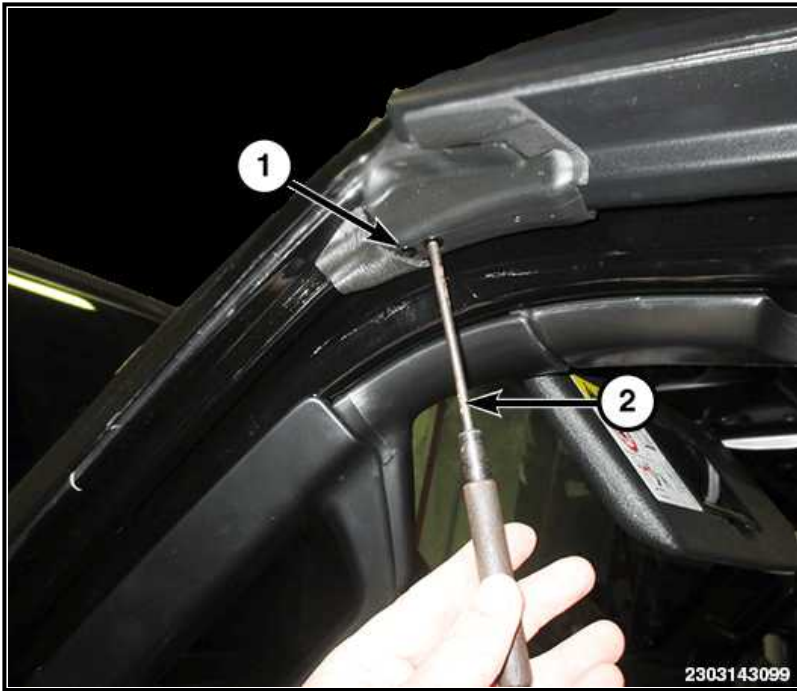
3. Verify the header seal is fully seated in the windshield frame and foam (1) is not visible between frame and seal. If visible, pull end of header seal forward.



1. Left hand spear foam
2. Right hand spear foam
3. 30 mm (1.2 in.)
4. 85 mm (3.4 in.)
5. 15 mm (0.6 in.)
6. 140 mm (5.5 in.)
7. 10 mm (0.4 in.)

4. Windshield Header Foam/Butyl Replacement (change to spear foam):
- Replaces usage of L-Foam, Butyl Chicklet, and Razer foam
 - Improves manufacturability, water sealing, and wind noise capabilities
 - 4 mm Ebony ESL 600 material
 - Butyl backing (adhesive)

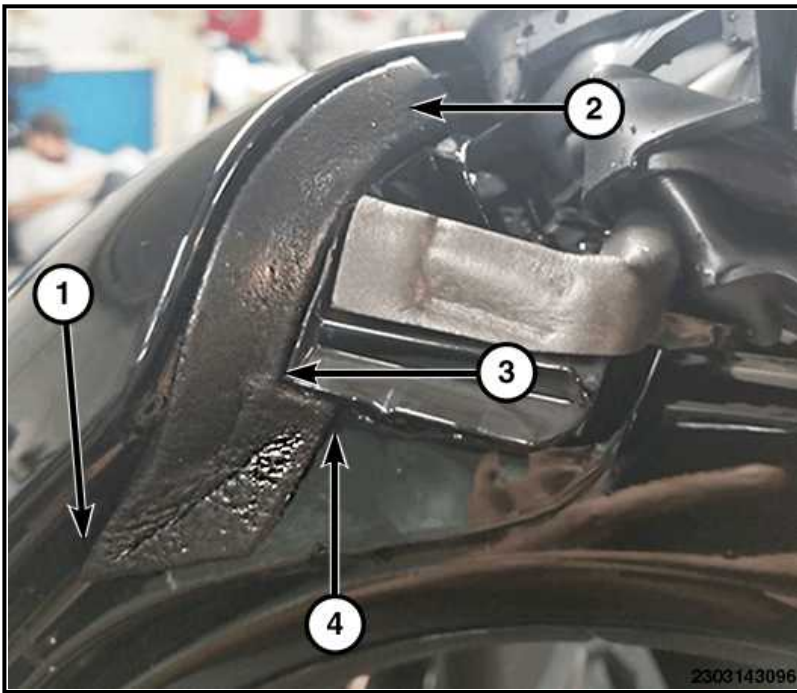
- LH and RH mirrored parts



5. Using a small punch (2) or equivalent, remove the seal rivets and lift the end of the seal out of the way.

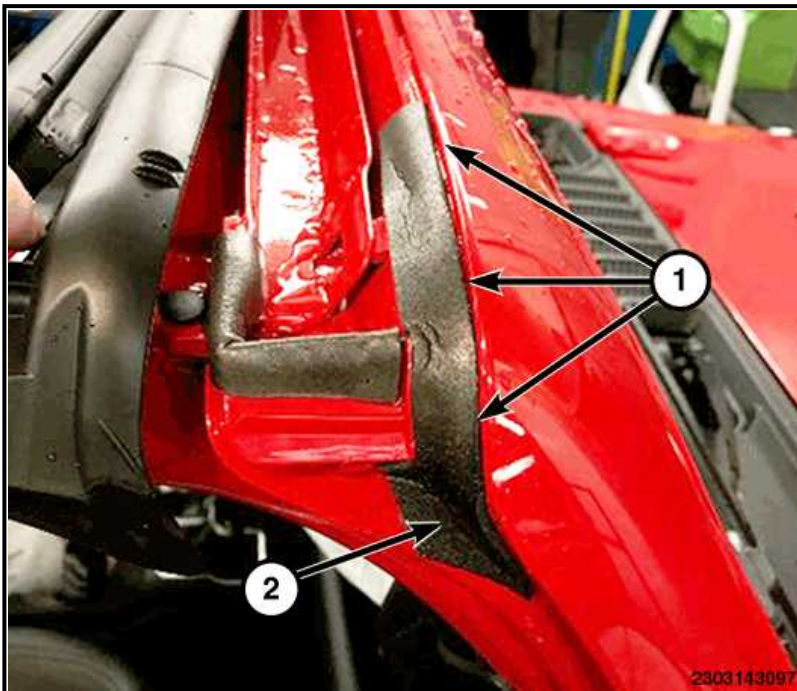


6. Remove L shaped foam (1), butyl patch (2) and lower razor foam (3) and clean all surfaces fully prior to installation of the new spear foam.

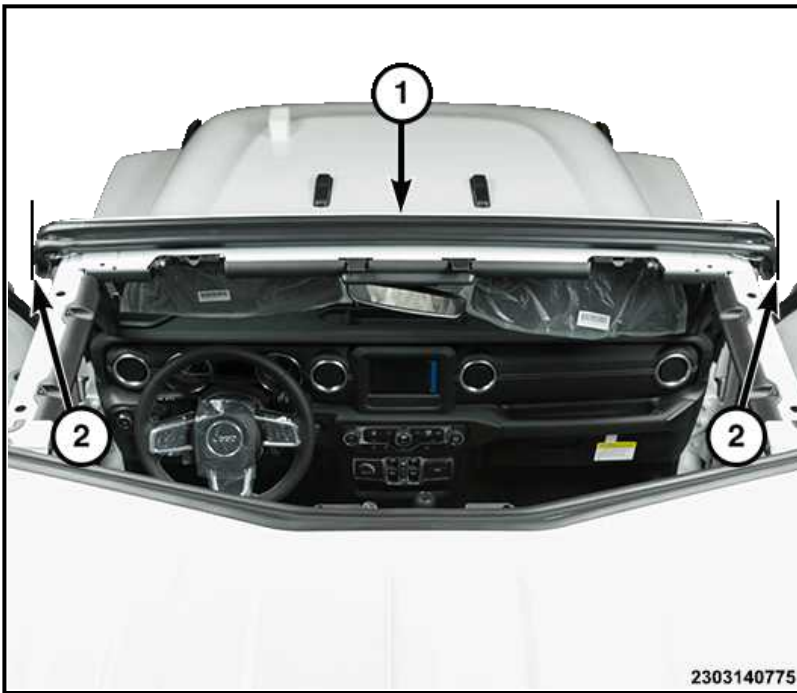


7. Begin installation by placing the spear foam onto the windshield frame.

1. Start at the tip of the foam (1).
2. Place tip into radius of windshield frame (1) as shown in illustration.
3. Foam corner (3) sits parallel with windshield header bathtub (4).



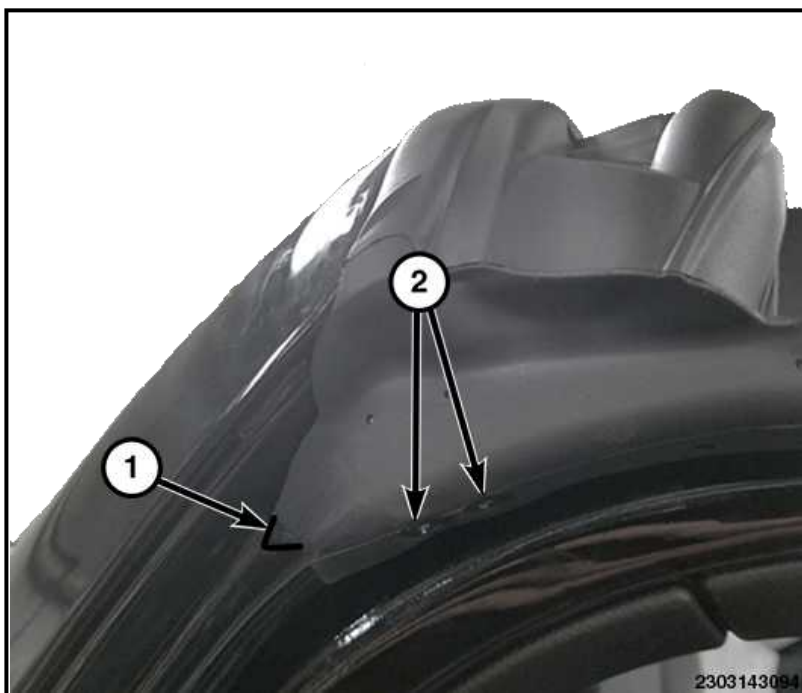
8. Seat the remaining foam around the header of the windshield frame maintaining a tight even gap to the forward edge of the frame (1).
9. Verify the foam is fully seated to windshield frame along the radius to avoid pocketing under the foam (2) that can allow water to pass.



10. Verify the header seal (1) is positioned evenly side to side (2).



11. Verify the header seal is fully seated in the windshield frame and foam (1) is not visible between frame and seal. If visible, pull end of header seal forward.

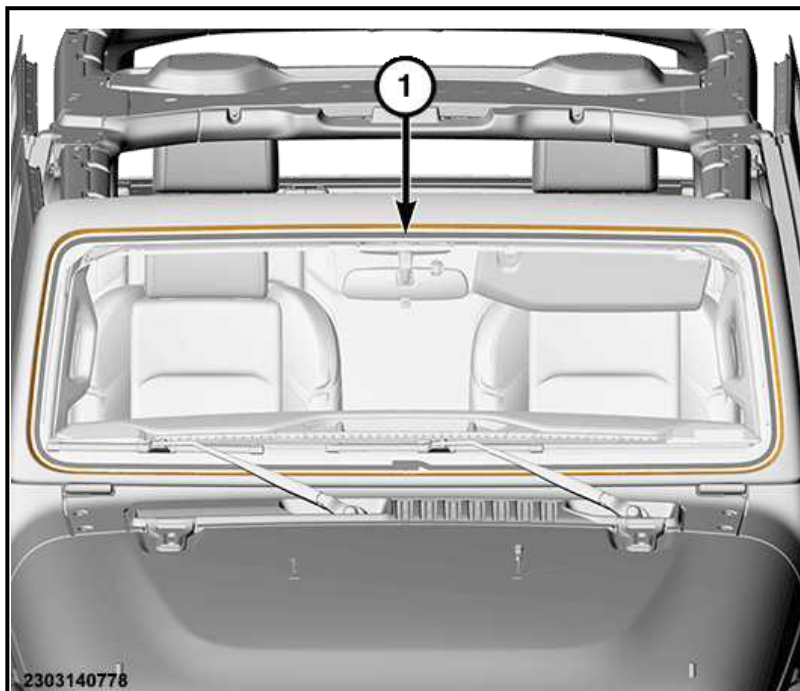


12. Install the new rivets (2).

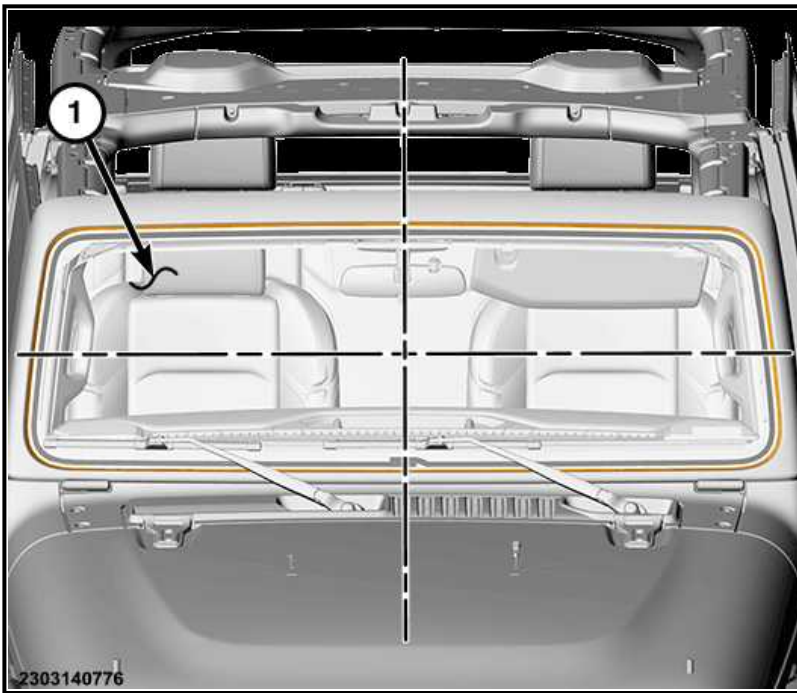
NOTE: A slight bit of the spear foam should protrude from the lower feathered edge of the seal (1) when properly installed.

WINDSHIELD CORRECTIONS

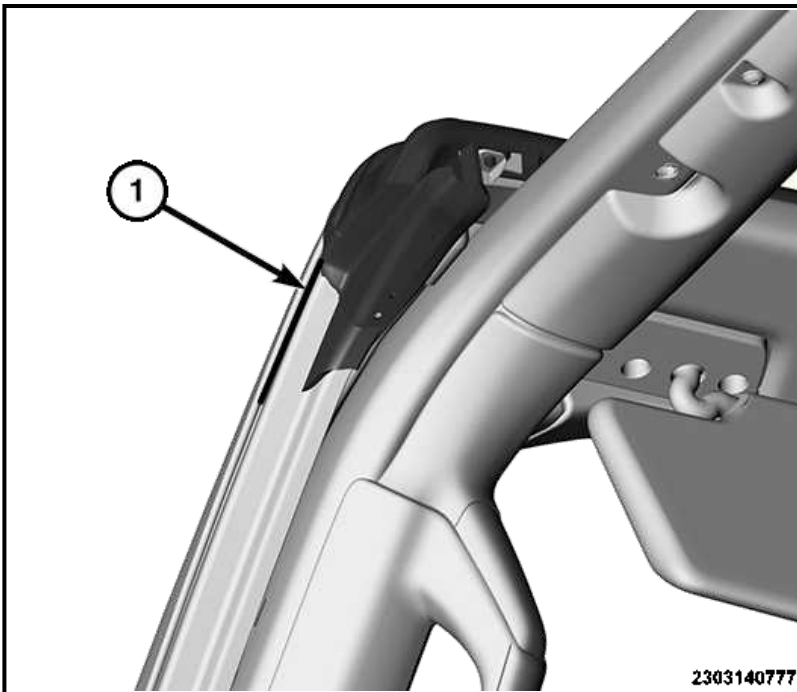
Refer to [WIND NOISE CONDITION INDEX](#).



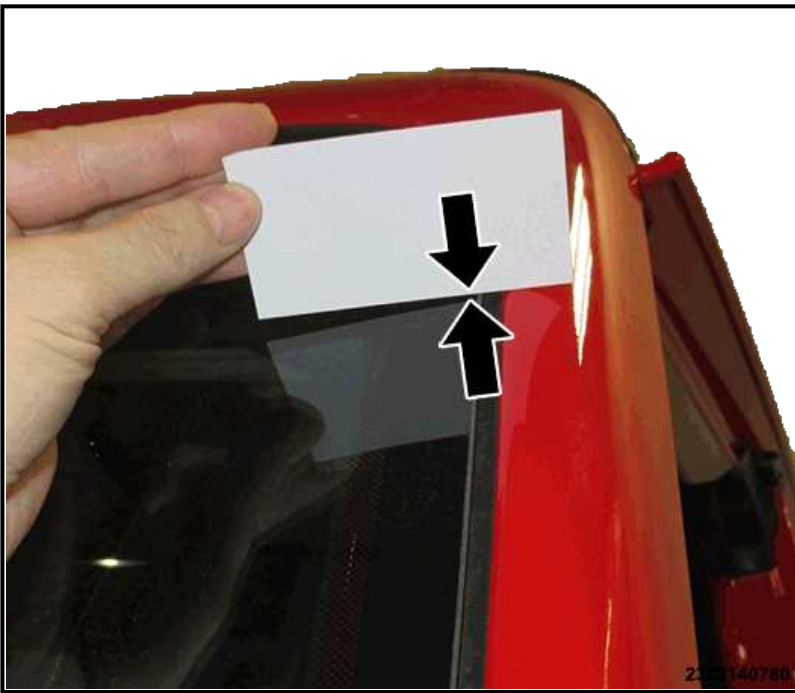
1. Check windshield urethane (1) for voids or gaps using soap and air.



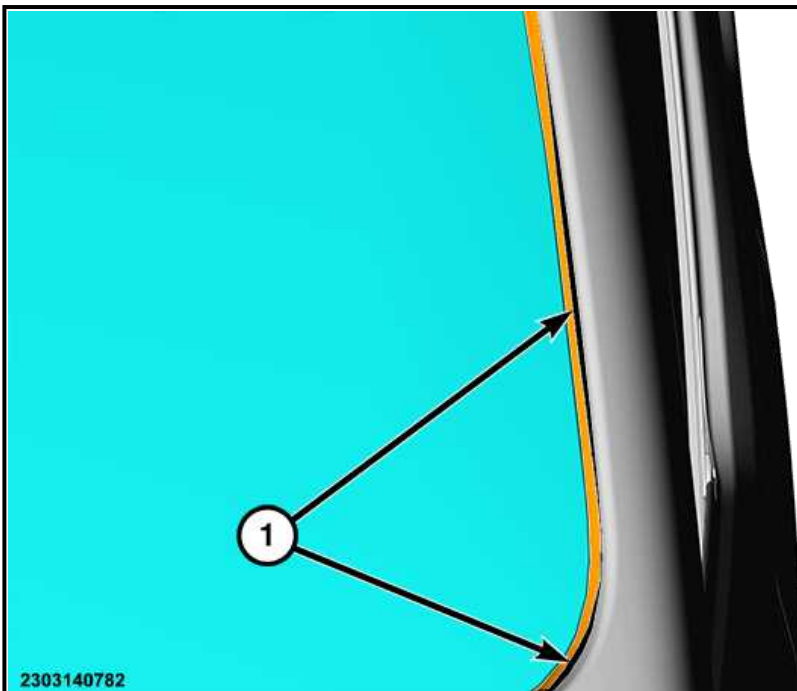
2. Verify the windshield (1) is positioned correctly and centered in the windshield frame.



3. Check windshield frame panel seam sealer (1) using shop air and soap test. Using a paintable repair sealer Part No. 04318026AB or equivalent, repair as needed.



4. Verify the windshield sits under flush to the windshield frame. Check glass under flush to frame with a straight edge.



5. Verify the lace molding is contacting the windshield frame surround (1) and is centered in frame.



6. With windshield lowered, check for open holes at bottom of frame, near drain tube grommet. Install butyl patches.

STANDARD PROCEDURE

BUZZ, SQUEAKS AND RATTLES

Buzz, Squeaks and Rattles (BSRs) may be caused by any one or more of the following and may be corrected as indicated:

- Loose fasteners should be tightened to specifications.
- Damaged or missing clips should be replaced.
- Damaged trim panels should be replaced.
- Incorrectly installed trim panels should be reinstalled properly.

Many BSR complaints such as loose trim, can be serviced using various tapes or lubricants. Tapes including foam, flock and anti-squeak, can be used to eliminate noises caused by metal, plastic and vinyl components. Long life lubricants and greases can also be used on a variety of components. Refer to the table for materials and usage. Refer to **BUZZ, SQUEAKS AND RATTLES**.

BUZZ, SQUEAKS AND RATTLES

ITEM	FEATURES	APPLICATIONS	SERVICE TEMP
ITCH AND SQUEAK TAPE	An abrasion resistant material thin enough to conform to most irregular surfaces. Stops most itches and squeaks.	Between metal and metal, metal and plastic, metal and vinyl, vinyl and plastic. Interior trim panels. Examples: Trim panels and bezels.	-40B° to 107B°C (-40B° to 225B°F)
BLACK NYLON FLOCK	Nylon Flock with an aggressive acrylic adhesive. Provides for cushioning and compression fit, also isolates components. Water-resistant.	Between metal and metal, metal and plastic, vinyl and plastic. Examples: Pull cups, bezels, clips, ducts, top cover to glass, cowl panel.	-40B° to 82B°C (-40B° to 180B°F)
HIGH DENSITY URETHANE FOAM	Tear resistant, highly resilient and durable.	Between metal and metal, metal and plastic. Water-resistant.	-40B° to 82B°C (-40B° to 180B°F)

ITEM	FEATURES	APPLICATIONS	SERVICE TEMP
		Examples: I/P, heavy metal rattles, isolating brackets.	
OPEN CELL FOAM TAPE	Soft foam conforms to irregular surfaces.	Wire harness and connector wrap. Examples: Seals, gasket, wiring, heat ducts.	-40B° to 82B°C (-40B° to 180B°F)
CLOSED CELL LOW DENSITY FOAM TAPE	Soft, conformable. Water-resistant.	Wherever bulk is needed. Prevents closing flutters and rattles when applied to door watershield. Examples: Door, I/P.	-40B° to 82B°C (-40B° to 180B°F)
NYEB® GREASE 880	Long life.	Suspensions. Examples: Strut bushings, sway bars.	-40B° to 200B°C (-40B° to 390B°F)
KRYTOXB® OIL	Long life. Will not dry out or harm plastics or rubber.	When access is not possible, oil will migrate to condition. Vinyl, rubber, plastic, metal. Examples: Convertible top bushings, pull cups trim panel inserts.	-34B° to 205B°C (-30B° to 400B°F)
KRYTOXB® GREASE	Long life. Will not dry out or harm plastics or rubber.	Vinyl, rubber, plastic, metal, glass. Examples: Weather-strips, backlite and windshield moldings.	-34B° to 205B°C (-30B° to 400B°F)

HEAT STAKING

1. Remove the trim panel.
2. Bend or move the trim panel components at the heat staked joints. Observe the heat staked locations and component seams for looseness.
3. Heat stake the components.
 - a. If the heat staked or component seam location is loose, hold the two components tightly together and using a soldering gun with a flat tip, melt the material securing the components together. Do not over heat the affected area, damage to the exterior of the trim panel may occur.
 - b. If the heat staked material is broken or missing, use a hot glue gun to apply new material to the area to be repaired. The panels that are being heat staked must be held together while the applying the glue. Once the new material is in place, it may be necessary to use a soldering gun to melt the newly applied material. Do not over heat the affected area, damage to the exterior of the trim panel may occur.
4. Allow the repaired area to cool and verify the repair.
5. Install the trim panel.

NET, FORM AND PIERCE REPAIR

CAUTION: Failure to follow these recommendations could result in damage or failure to the part and the related parts.

Net, form and pierce is a manufacturing process which takes place during the original build of the vehicle. The original part will have a beveled platform that will decrease toward the fastener location mounting hole. Replacement parts in these areas may not include bevel (form) or fastener hole (pierce) and will need to be adapted for proper fit and finish.

The primary locations which may utilize net, form and pierce are:

- Fender reinforcement (at front end module mount)
- Fender tower mounts
- Hood hinge (lower half)
- Rear body header (liftgate hinge mounts)
- Strut tower (at upper control arm mount)

NOTE: Shock tower is net, pierce only.

NOTE: The thickness of shims is not to exceed the original thickness of the factory bevel. If more shims are needed damage is still present and must be repaired properly.

If the replacement part did not come with a fastener hole, one of equal size and location will have to be drilled. Body shims should be used in the fender reinforcement to front end module. The hood hinge area, fender tower mounts, and rear body header will utilize washers as spacers where a specific spacer does not exist. The shims and spacers should be sealed between each other and to the stationary surface. Care should be taken when smoothing sealer around washers to give an undetectable repair. Refinish the repair area per the paint manufacturer's recommendations for corrosion resistance and appearance purposes.

PLASTIC BODY PANEL REPAIR

There are many different types of plastics used in today's automotive environment. We group plastics in three different categories: Rigid, Semi-Rigid, and Flexible. Any of these plastics may require the use of an adhesion promoter for repair. These types of plastic are used extensively in automotive applications. Always follow repair material manufacturer's plastic identification and repair procedures.

SAFETY PRECAUTION AND WARNINGS

WARNING: Eye protection should be used when servicing components. Personal injury can result.

Use an OSHA approved breathing mask when mixing epoxy, grinding, and spraying paint or solvents in a confined area. Personal injury can result.

Avoid prolonged skin contact with resin, petroleum, or alcohol based solvents. Personal injury can result.

Do not venture under a hoisted vehicle that is not properly supported on safety stands. Personal injury can result.

CAUTION: When holes must be drilled or cut in body panels, verify locations of internal body components and electrical wiring. Damage to vehicle can result.

Do not use abrasive chemicals or compounds on undamaged painted surfaces around repair areas. Damage to finish can result.

RIGID PLASTICS

Examples of rigid plastic use: fascias and other body panels, which include SMC, ABS, and polycarbonates.

SEMI-RIGID PLASTICS

Examples of semi-rigid plastic use: interior panels, under hood panels, and other body trim panels.

FLEXIBLE PLASTICS

Examples of flexible plastic use: fascias, body moldings, and upper and lower fascia covers.

REPAIR PROCEDURE

The repair procedure for all three categories of plastics is basically the same. The one difference is the material used for the repair. The materials must be specific for each substrate, rigid repair material for rigid plastic repair, semi-rigid repair material for semi-rigid plastic repair and flexible repair material for flexible plastic repair.

ADHESION PROMOTER/SURFACE MODIFIER

Adhesion promoters/surface modifiers are required for certain plastics. All three categories may have plastics that require the use of adhesion promoter/surface modifiers. Always follow repair material manufacturer's plastic identification and repair procedures.

RIGID, SEMI-RIGID, AND FLEXIBLE PLASTIC PARTS TYPES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
ASA	Acrylonitrile Styrene Acrylite	Lurans	Consoles, Grilles
ABS	Acrylonitrile Butadiene Styrene	Terluran	A-pillars, Consoles, Grilles
ABS/PC	ABS/PC Alloy	Pulse, Proloy, Bayblend	Doors, Instrument Panels
ABS/PVC	ABS/PV Alloy	Proloy, Pulse, Lustran, Cyclovin	Door Panels, Grilles, Trim
BMC	Bulk Molding Compound	BMC	-
EMA	Ehtylene Methyl Acrylate/Ionomer	Surlyn, EMA, Ionomer	Bumper Guards, Pads
METTON	Metton	Metton	Grilles, Kick Panels, Running Boards
MPPO	Modified Polyphenylene Oxide	MPPO	Spoiler Assembly
PA	Polyamid	Zytel, Vydyne, PA, Minlon	-
PET	Thermoplastic Polyester	Rynite	Trim
PBT/PPO	PBT/PPO Alloy	Germax	Claddings
PBTP	Polybutylene Therephtalate	PBT, PBTP, Pocan, Valox	Wheel Covers, Fenders, Grilles
PBTP/EEBC	Polybutylene Therephtalate/EEBC Alloy	Bexloy, "M", PBTP/EEBC	Fascias, Rocker Panel, Moldings
PC	Polycarbonate	Lexan, Merlon, Calibre, Makrolon PC	Tail Light Lenses, I/P Trim, Valance Panels
PC/ABS	PC/ABS Alloy	Germax, Bay Blends, Pulse	Doors, Instrument Panels
PPO	Polyphenylene Oxide	Azdel, Hostalen, Marlex, Prfax, Noryl, GTX, PPO	Interior Trim, Door Panels, Splash Shields, Steering Column Shroud
PPO/PA	Polyphenylene/Polyamid	PPO/PA, GTX 910	-
PR/FV	Fiberglass Reinforced Plastic	Fiberglass, FV, PR/FV	Body Panels
PS	Polystyrene	Lustrex, Styron, PS	Door Panels, Dash Panels
RTM	Resin Transfer Molding Compound	RTM	Body Panels
SMC	Sheet Molded Compound	SMC	Body Panels
TMC	Transfer Molding Compound	TMC	Grilles
UP	Unsaturated Polyester (Thermosetting)	SMC, BMC, TMC, ZMC, IMC, XSMC, UP	Grille Opening Panel, Liftgates, Flareside Fenders, Fender Extensions
EEBC	Ether/Ester Blocked Co-Polymer	EEBC	Bumpers

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
EEBC/PBTP	EEBC/Polybutylene Terephthalate	EEBC, PBTP, BEXLOY	Bumper, Rocker Panels
EMPP	Ethylene Modified Polypropylene	EMPP	Bumper Covers
EPDM	Ethylene/Propylene Diene Monomer	EPDM, Nordel, Vistalon	Bumpers
EPM	Ethylene/Propylene Co-Polymer	EPM	-
MPU	Foam Polyurethane	MPU	Spoilers
PE	Polyethylene	Alathon, Dylan, Lupolen, Marlex	-
PP	Polypropylene (Blends)	Noryl, Azdel, Marlox, Dylan, Pravex	Spoilers, Kick Panels, A-Pillars, Door Panels, B-Pillars, Quarter Panels, Sport Bar Trim, Liftgate Trim, Decklid Trim Scuff Plates, Kick Panels, Consoles
PP/EPDM	PP/EPDM Alloy	PP/EPDM	Spoilers, Grilles
PUR	Polyurethane	Colonels, PUR, PU	Fascias, Bumpers
PUR/PC	PUR/PC Alloy	Texin	Bumpers
PVC	Polyvinyl Chloride	Apex, Geon, Vinylite	Body Moldings, Wire Insulation, Steering Wheels
RIM	Reaction Injected Molded Polyurethane	RIM, Bayflex	Front Fascias, Modular Windows
RRIM	Reinforced Reaction Injected Molded	PUR, RRIM	Fascias, Body Panels, Body Trims
TPE	Thermo Polyethylene	TPE, Hytrel, Bexloy-V	Fascias, Bumpers, Claddings
TPO	Thermopolyolefin	Polytrope, Renflex, Santoprene, Visaflex, ETA, Apex, TPO, Shields, Claddings	Bumpers, End Caps, Telcar, Rubber, Strips, Sight, Interior B-Pillar
TPP	Thermo-Polypropylene	TPP	Bumpers
TPU	Thermopolyurethane, Polyester	TPU, Hytrel, Texin, Estane	Bumpers, Body Side, Moldings, Fascias

PANEL SECTIONING

If it is required to section a large panel for a plastic repair, it will be necessary to reinforce the panel. To bond two plastic panels together, a reinforcement must overlap both panels. The panels must be beveled at a 20 degree angle. The area to be reinforced should be washed, then sanded. Be sure to wipe off any excess soap and water when finished. Lightly sand or abrade the plastic with an abrasive pad or sandpaper. Blow off any dust with compressed air or wipe with a clean dry rag.

When bonding plastic panels, follow repair material manufacturers recommendations. Be sure that enough adhesive has been applied to allow squeeze out and to fill the full bond line. Once the pieces have been brought together, do not move them until the adhesive is cured. The assembly can be held together with clamps, rivets, etc. A faster cure can be obtained by heating with a heat lamp or heat gun. After the parts have been bonded and have had time to cure, rough sand the seam and apply the final adhesive filler to the area being repaired. Smooth the filler with a spreader, wooden tongue depressor, or squeegee. For fine texturing, a small amount of water can be applied to the filler surface while smoothing. The cured filler can be sanded as necessary and, as a final step, cleanup can be done with soapy water. Wipe the surface clean with a dry cloth allowing time for the panel to dry before moving on with the repair.

PANEL REINFORCEMENT

Structural repair procedures for rigid panels with large cracks and holes will require a reinforcement backing. Reinforcements can be made with several applications of glass cloth saturated with structural adhesive. Semi-rigid or flexible repair materials should be used for semi-rigid or flexible backing reinforcement. Open meshed fiberglass drywall tape can be used to form a reinforcement. The drywall tape allows the resin to penetrate through and make a good bond between the panel and the adhesive. Structurally, the more drywall tape used, the stronger the repair.

Another kind of repair that can be done to repair large cracks and holes is to use a scrap piece of similar plastic and bond with structural adhesive. The reinforcement should cover the entire break and should have a generous amount of overlap on either side of the cracked or broken area.

When repairing plastic, the damaged area is first "V'd" out, or beveled. Large bonding areas are desirable when repairing plastic because small repairs are less likely to hold permanently. Beveling the area around a crack at a 20 degree angle will increase the bonding surface for a repair. It is recommended that sharp edges be avoided because the joint may show through after the panel is refinished.

- Panel repair for both flexible and rigid panels are basically the same. The primary difference between flexible panel repair and rigid panel repair is in the adhesive materials used.
- The technician should first decide what needs to be done when working on any type of body panel. One should determine if it is possible to return the damaged part to its original strength and appearance without exceeding the value of the replacement part.
- When plastic repairs are required, it is recommended that the part be left on the vehicle whenever possible. That will save time, and the panel will remain stationary during the repair. Misalignment can cause stress in the repair areas and can result in future failure.

VISUAL INSPECTION

Composite materials can mask the severity of an accident. Adhesive bond lines, interior structure of the doors, and steel structures need to be inspected carefully to get a true damage assessment. Close inspection may require partial removal of interior trim or inner panels.

Identify the type of repair: Puncture or Crack - Damage that has penetrated completely through the panel. Damage is confined to one general area; a panel section is not required. However, a backer panel, open fiberglass tape, or matted material must be bonded from behind.

PANEL SURFACE PREPARATION

If a body panel has been punctured, cracked, or crushed, the damaged area must be removed from the panel to achieve a successful repair. All spider web cracks leading away from a damaged area must be stopped or removed. To stop a running crack in a panel, drill a 6 mm (0.250 in.) hole at the end of the crack farthest away from the damage. If spider web cracks can not be stopped, the panel will require replacement. The surfaces around the damaged area should be stripped of paint and freed from wax and oil. Scuff surfaces around repair area with 360 grit wet/dry sandpaper, or equivalent, to insure adhesion of repair materials.

PATCHING PANELS

If a panel that has extensive puncture type damage, the panel can be repaired by cutting out the damaged material. Use a suitable reciprocating saw or cut off wheel to remove the section of the panel that is damaged. The piece cut out can be used as a template to shape the new patch. It is not necessary to have access to the back of the panel to install a patch. Bevel edges of cutout at 20 degrees to expose a larger bonding area on the outer side. This will allow for an increased reinforcement area.

PANEL PATCH FABRICATIONS

A patch can be fabricated from any rigid fiberglass panel that has comparable contour with the repair area. If existing material is not available or compatible, a patch can be constructed with adhesive and reinforcement mesh (drywall tape). Perform the following operation if required:

1. Cover waxed paper or plastic with adhesive backed nylon mesh (drywall tape) larger than the patch required.
2. Tape waxed paper or plastic sheet with mesh to a surface that has a compatible contour to the repair area.
3. Apply a liberal coat of adhesive over the reinforcement mesh. If necessary apply a second or third coat of adhesive and mesh after first coat has cured. The thickness of the patch should be the same as the repair area.
4. After patch has cured, peel waxed paper or plastic from the back of the patch.
5. If desired, a thin film coat of adhesive can be applied to the back of the patch to cover mesh for added strength.

PANEL PATCH INSTALLATION

1. Make a paper or cardboard pattern the size and shape of the cutout hole in the panel.
2. Trim 3 mm (0.125 in.) from edges of pattern so patch will have a gap between connecting surfaces.
3. Using the pattern as a guide, cut the patch to size.
4. Cut scrap pieces of patch material into 50 mm (2.0 in.) squares to use as patch supports to sustain the patch in the cutout.
5. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) in from edge of cutout hole.
6. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) away from edge of patch across from holes drilled around cutout.
7. Drill 3 mm (0.125 in.) holes in the support squares 13 mm (0.5 in.) from the edge in the center of one side.
8. Scuff the backside of the body panel around the cutout hole with a scuff pad or sandpaper.
9. Mix enough adhesive to cover one side of all support squares.
10. Apply adhesive to cover one side of all support squares.
11. Using number 8 sheet metal screws, secure support squares to back side of body panel with adhesive sandwiched between the panel and squares.
12. Position patch in cutout against support squares and adjust patch until the gap is equal along all sides.
13. Drill 3 mm (0.125 in.) holes in the support squares through the pre-drilled holes in the patch.
14. Apply a coat of adhesive to the exposed ends of the support squares.
15. Install screws to hold the patch to support squares. Tighten screws until patch surface is flush with panel surface.
16. Allow adhesive to cure, and remove all screws.
17. Using a 125 mm (5.0 in.) 24 grit disc grinder, grind a 50 mm (2.0 in.) to 75 mm (3.0 in.) wide and 2 mm (0.080 in.) deep path across the gaps around the patch. With compressed air, blow dust from around patch.
18. Apply adhesive backed nylon mesh (drywall tape) over gaps around patch.
19. Mix enough adhesive to cover the entire patch area.
20. Apply adhesive over the mesh around patch, and smooth epoxy with a wide spreader to reduce finish grinding. Use two to three layers of mesh and adhesive to create a stronger repair.

PATCHED PANEL SURFACING

After patched panel is installed, the patch area can be finished using the same methods as finishing other types of body panels. If mesh material is exposed in the patched area, grind surface down, and apply a coat of high quality rigid plastic body filler. Prime, block sand, and paint as required.

TECHNICAL SPECIFICATIONS

BODY LUBRICATION SPECIFICATIONS

LUBRICATION REQUIREMENTS

Body mechanisms and linkages should be inspected, cleaned, and lubricated, as required, to maintain ease of operation and to provide protection against rust and wear. When performing other under hood services, the hood latch release mechanism and safety catch should be inspected, cleaned, and lubricated. During the winter season, external door lock cylinders should be lubricated to help with proper operation when exposed to water and ice.

Prior to the application of any lubricant, the parts concerned should be wiped clean to remove dust and grit. If necessary, a suitable solvent can be used to clean the item to be lubricated. After lubricating a component, any excess oil or grease should be removed.

BODY COMPONENT	LUBRICANT TYPE
Door Hinges	Engine Oil
Hood Hinges	Engine Oil
Liftgate Hinges	Engine Oil
Door Check Straps	MoparB® Spray White Lube or Equivalent
Hood Latches	MoparB® Spray White Lube or Equivalent
Hood and Liftgate Prop Pivots	MoparB® Spray White Lube or Equivalent
Fuel Filler Door Remote Control Latch Mechanism	MoparB® Spray White Lube or Equivalent
Parking Brake Mechanism	MoparB® Spray White Lube or Equivalent
Sliding Seat Tracks	MoparB® Spray White Lube or Equivalent
Liftgate Latch	MoparB® Spray White Lube or Equivalent
All Other Hood Mechanisms	MoparB® Multipurpose Grease or Equivalent
Door Lock Cylinders	MoparB® Lock Cylinder Lubricant or Equivalent
Liftgate Lock Cylinder	MoparB® Lock Cylinder Lubricant or Equivalent

LUBRICANT APPLICATION

DOOR LOCK CYLINDERS

1. Apply a small amount of lubricant directly into the lock cylinder.
2. Apply a small amount of lubricant to the key.
3. Insert key into lock cylinder and cycle the mechanism from the locked to the unlocked position.

NOTE: Do not add more lubricant.

4. Cycle the lock cylinder mechanism several times to allow the lubricant to flow throughout the cylinder.
5. Wipe all lubricant from exterior of lock cylinder and key.

ALL OTHER BODY MECHANISMS

1. Clean component as described above.
2. Apply specified lubricant to all pivoting and sliding contact areas of component.

LUBRICANT USAGE

ENGINE OIL

- Door hinges - hinge pin and pivot contact areas
- Hood hinges - pivot points
- Liftgate hinges

MOPARB® SPRAY WHITE LUBE OR EQUIVALENT

- Door check straps

- Hood latches
- Hood and decklid prop pivots
- Ash receiver
- Fuel filler door remote control latch mechanism
- Parking brake mechanism
- Sliding seat tracks
- Liftgate latch

MOPARB® MULTIPURPOSE GREASE OR EQUIVALENT

- All other hood mechanisms

MOPARB® LOCK CYLINDER LUBRICANT OR EQUIVALENT

- Door lock cylinders
- Liftgate lock cylinder

TORQUE SPECIFICATIONS

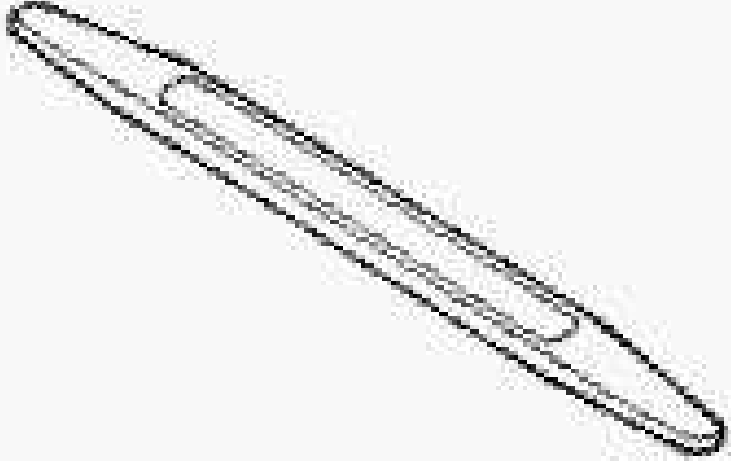
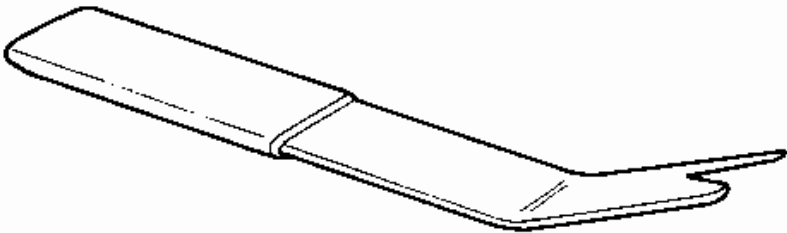
DESCRIPTION	N.m	Ft Lbs	In Lbs	COMMENT
A-pillar grab handle bolts	9	-	80	B
B-pillar grab handle bolts	9	-	80	B
B-pillar trim to Sport Bar	9	-	80	B
Backlite to hard top bolts	11	8	-	B
				CAUTION: Whenever a body isolator bolt requires servicing or tightening, it is necessary to remove the bolt and install new thread locker compound to the threads.
Body isolator A-pillar bolt	125	92	-	
Body isolator B-pillar bolt - body bolt	107	79	-	CAUTION: Whenever a body isolator bolt requires servicing or tightening, it is necessary to remove the bolt and install new thread locker compound

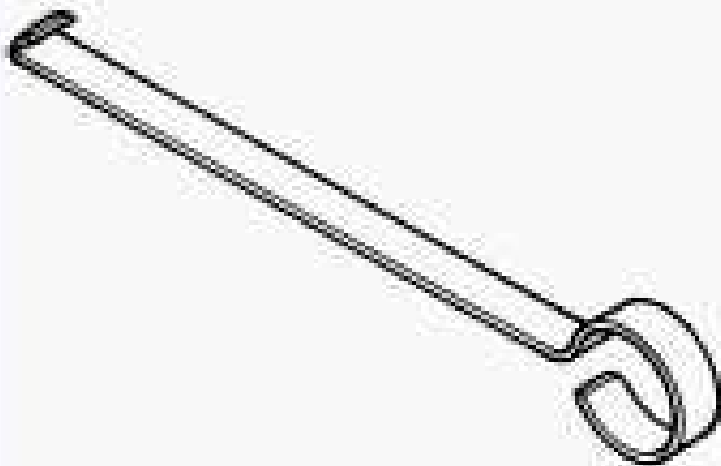
DESCRIPTION	N.m	Ft Lbs	In Lbs	COMMENT
				to the threads.
Body isolator B-pillar bolt - frame nuts	49	36	-	B
				CAUTION: Whenever a body isolator bolt requires servicing or tightening, it is necessary to remove the bolt and install new thread locker compound to the threads.
Body isolator C-pillar bolt - body bolt	125	92	-	
Body isolator C-pillar bolt - frame nuts	49	36	-	B
Body isolator front - body nuts	49	36	-	B
Body isolator front - frame nut	125	92	-	B
Bulkhead to Instrument panel bolts	20	15	-	B
Cargo box hold down bolts	80	59	-	B
Cowl panel end bolts	9	-	80	B
Cowl side panel to body bolts	8	-	71	B
Door armrest bolts	8	-	71	B
Door beam bracket to hinge pillar	23	17	-	B
Door carrier plate to door bolts	7	-	62	B
Door frame rail - front	8	-	71	B
Door frame rail - rear	8	-	71	B
Door check strap to door nuts	11	8	-	B
Door check strap to pillar bolt	9	-	80	B
Door exterior handle support bracket screw	1.9	-	17	B
Door exterior handle screw	1.9	-	17	B
Door glass to regulator bolts	14	10	-	B
Door glass channel to door nut	11	8	-	B
Door hinge pivot nuts	5	-	44	B
Door hinge to door bolts	28	21	-	B
Door hinge to pillar bolts	48	35	-	B
Door interior handle bolt	7	-	62	B
Door latch bolts	7	-	62	B
Door striker bolts	17	13	-	B
Exterior mirror fasteners	6	-	53	B
Fender to body bolts	7	-	62	B
Folding top lift assist to sport bar bolts	14	10	-	B
Front fender flare bolts	7	-	62	B

DESCRIPTION	N.m	Ft Lbs	In Lbs	COMMENT
Front fender flare bolts	7	-	62	B
Front seat back bolts	73	54	-	B
Front seat track bolts	47	35	-	B
Front seat track back bolts	47	35	-	B
Front wheelhouse splash shield to fender flare screws	5	-	44	B
Hard top to body bolts	12	9	-	B
Hard top to B-pillar bolts	12	9	-	B
Hard top front receiver bracket bolts	12	9	-	B
Hood catch bracket to hood nuts	5	-	44	B
Hood catch to fender nuts	10	-	89	B
Hood hinge to body bolts	25	18	-	B
Hood hinge to hood bolts	20	15	-	B
Hood pop up spring bolt	10	-	89	B
Hood prop rod bolts	8	-	71	B
Hood safety hook to hood bolts	10	-	89	B
Instrument panel carrier bolts	12	9	-	B
Instrument panel cross brace to body bolts	20	-	15	B
Instrument panel cowl bolts	9	-	80	B
Instrument panel dash bolts	6	-	53	B
Instrument panel to center floor nut	10	-	89	B
Instrument panel to center floor bolt	10	-	89	B
Power top assembly to body screws	5	-	44	B
Radiator crossmember bolts	11	8	-	B
Radiator crossmember brace bolts	9	-	80	B
Rearview mirror to header screw	6	-	56	B
Second row seat bolts	47	35	-	B
Second row seat pivot bolts	45	33	-	B
Second row seat frame bolts	40	35	-	B
Side step/Rock rail to body bolts	28	21	-	B
Side step/Rock rail nuts	15	11	-	B
Soft top #1 bow cable bracket fasteners	5	-	44	B
Soft top #1 bow to linkage fasteners	5	-	44	B
Soft top #2 bow to linkage fasteners	7	-	62	B
Soft top #3 bow to linkage fasteners	7	-	62	B
Soft top #4 bow to linkage fasteners	7	-	62	B
Soft top #5 bow to linkage fasteners	7	-	62	B
Soft top center lower body rail fasteners	12	9	-	B
Soft top corner lower body rails fasteners	23	17	-	B
Soft top corner lower body rails to center rail fasteners	10	-	89	B
Soft top J-rail retainer fasteners	7	-	62	B
Soft top to front door rail fasteners	9	-	80	B
Soft top to rear door rail fasteners	5	-	44	B
Soft top upper door rail fasteners	4	-	35	B

DESCRIPTION	N.m	Ft Lbs	In Lbs	COMMENT
Tailgate cable to box anchor bolts	23	17	-	B
Tailgate cable to tailgate bolt	15	11	-	B
Tailgate cleat to cargo box fastener	16	12	-	B
Tailgate cover fasteners	7	-	62	B
Tailgate latch bolts	18	13	-	B
Tailgate latch control assembly nuts	6	-	53	B
Tailgate latch striker	20	15	-	B
Tailgate lock plate screw	23	17	-	B
Tailgate pivot bracket to box	65	48	-	B
Tailgate pivot bracket to tailgate	33	24	-	B
Tonneau bracket to bedside fasteners	5	-	44	B
Tonneau bracket to bulkhead bolts	15	11	-	B
Trough cross body to body fasteners	5	-	44	B
Trough left to body in white fasteners	5	-	44	B
Utility rail fasteners	6	-	53	B
Windshield frame to header bolts	17	12	-	B
Windshield hinge to cowl frame bolts	30	22	-	B
Windshield hinge to windshield frame bolts	25	18	-	B

SPECIAL TOOLS

	C-4755 - Trim Stick (Originally Shipped In Kit Number(s) 9299, 9299CC, 9299CC, 9300A-CAN.)
	C-4829A - Remover, Trim

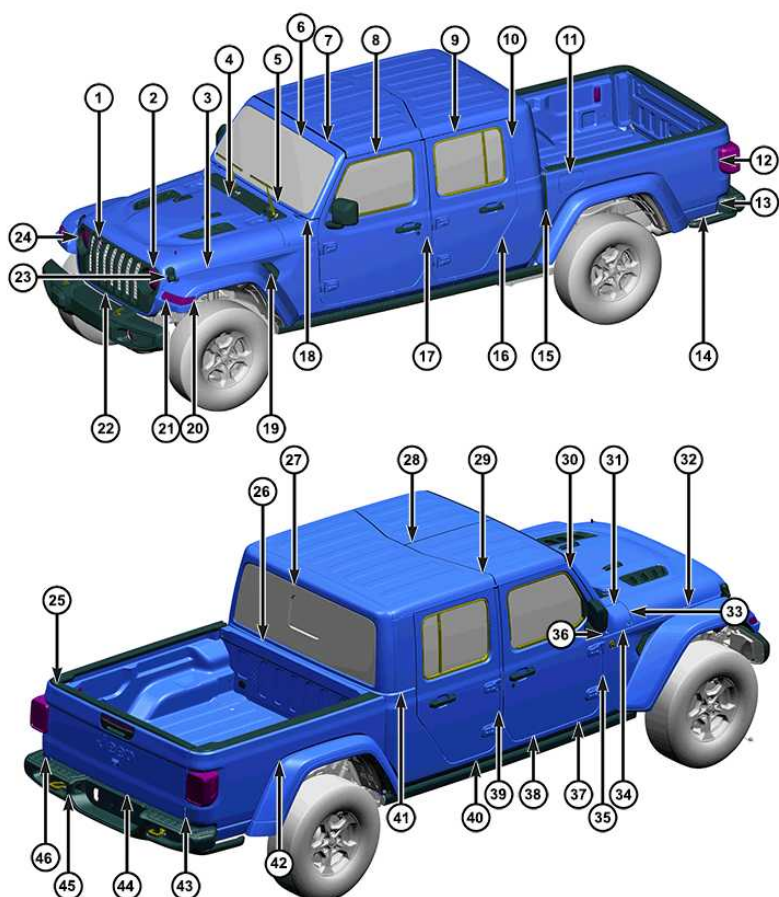


9093 - Remover, Belt Moldings
(Originally Shipped In Kit Number(s)
9076, 9090, 9090CC, 9098, 9098CC.)

BODY STRUCTURE

GAP AND FLUSH

SPECIFICATIONS



2306147020

NOTE: All dimensions are in millimeters.

- O/F = Over Flush
- U/F = Under Flush
- U/D = Up/Down

- **F/A = Fore/Aft**

DIMENSION	DESCRIPTION	GAP	FLUSH
1 (Base)	Hood to Grill	7.0 at top +/- 1.7 Transition to 5.6 at side +/- 1.7 Parallel within 1.7	Grill U/F 0.2 at center +/- 1.5 Transition to 0.4 at outboard +/- 1.5 Consistent within 1.5
1 (Rubicon)	Hood to Grill	6.5 at top +/- 1.7 Transition to 5.1 at side +/- 1.7 Parallel within 1.7	Grill U/F 0.2 at center +/- 1.5 Transition to 0.4 at outboard +/- 1.5 Consistent within 1.5
1 (BUX)	Hood to Grill	7.0 at top +/- 1.7 Transition to 6.0 at side +/- 1.7 Parallel within 1.7	Grill U/F 0.2 at center +/- 1.5 Transition to 0.4 at outboard +/- 1.5 Consistent within 1.5
2	Headlamp to Headlamp Bezel Headlamp to Grille (Sport)	3.9 +/- 1.6 Parallel within 1.6	-
3	Hood to Fender	7.0 +2.5 / - 1.5 Parallel within 1.5	Hood U/F 0.2 at front +2.5 / - 1.5 Transition to 0.1 at rear +2.5 / - 1.5 Side to side within 1.5
4 (Sahara and Sport)	Cowl Grill to Hood	5.0 +/- 1.5 Parallel within 1.5	Cowl U/F at inboard 0.7 +/- 1.6 Transition to O/F 0.1 at outboard +/- 1.6 Consistent within 1.6
4 (Rubicon)	Cowl Grill to Hood	5.0 +/- 1.5 Parallel within 1.5	Cowl O/F 0.5 at inboard +/- 1.6 Transition to 0.0 outboard +/- 1.6 Consistent within 1.6
4 (BUX)	Cowl Grill to Hood	5.0 +/- 1.5 Parallel within 1.5	0.0 +/- 1.6 Consistent within 1.6
5	Cowl Surround to Windshield Frame	5.1 +/- 1.5 Parallel within 1.5	Cowl U/F 1.0 +/- 1.5 Parallel within 1.5
6	Windshield to Windshield Frame	4.8 at top +/- 1.0 4.9 at sides +/- 1.0 5.1 at top corner +/- 1.0 5.3 at bottom corner +/- 1.0 Parallel within 1.0	Frame O/F 3.8 at top +/- 1.7 Transition to 4.2 at upper corner to 2.1 at upper side to 4.8 at lower corner to 4.8 at bottom +/- 1.7 Consistent within 1.7
7	Hard Top Front Panel to Windshield Frame	12.2 at center +/- 1.5 Transition to 12.5 at outboard corner to 12.0 at outboard +/- 1.5 Parallel within 1.5	Panel U/F at center 2.0 +/- 1.5 Transition to 3.4 at outboard corner to 1.6 at outboard +/- 1.5 Consistent within 1.5
8	Hard Top Front Panel to Front Door	4.7 +/- 1.5 Parallel within 1.5	Panel O/F 15.7 at front +/- 1.5 Transition to 15.4 at

DIMENSION	DESCRIPTION	GAP	FLUSH
			rear Consistent within 1.5
9	Hard Top to Rear Door	4.7 +/- 1.5 Parallel within 1.5	Door U/F 15.9 +/- 1.5 Transition to 15.5 at rear Consistent within 1.5
9	Soft Top to Rear Door	4.7 +/- 1.5 Parallel within 1.5	Door U/F 13.6 +/- 1.5 Transition to 13.2 at rear Consistent within 1.5
10	Hard Top to Rear Door at Side	4.5 +/- 1.5 Parallel within 1.5	0.0 +/- 1.5 Consistent within 1.5
10	Soft Top to Rear Door at Side	4.5 +/- 1.5 Parallel within 1.5	0.0 +/- 1.5 Consistent within 1.5
11	Fuel Door to Box Side Panel	2.5 +/- 0.9	Fuel Door 0.9 +/- 0.9 Consistent within 0.9
12	Taillamp to Box Side Panel	1.0 +/- 1.0 Parallel within 1.0	-
13 (Sport)	Rear Bumper to Box Side Cladding	14.8 at top +/- 2.6 Transition to 16.3 at bottom +/- 2.6 Parallel within 2.6	-
13 (Rubicon)	Rear Bumper to Box Side Cladding	13.7 +/- 2.6 Parallel within 2.6	-
14 (Rubicon)	Guard Rail to Box Side Cladding	24.1 +/- 2.4 At End Cap 14.7 +/- 2.4 Parallel within 2.4	-
15	Body Side Aperture to Box Side	34.8 +/- 4.0 at top Transition to 28.0 +/- 4.0 at bottom Parallel within 3.0	Body Side Aperture O/F 14.9 at top +/- 4.0 Transition to 14.0 to 18.8 at bottom +/- 4.0 Consistent within 3.0
15	Box Seal to Body Side Aperture	11.5 +/- 4.0 Transition to 6.4 to 7.0 at Floor	-
16	Rear Door to Body Side Aperture	4.5 +/- 1.0 Parallel within 1.0	Door U/F 0.4 at front +/- 1.0 Transition to 0.0 at top +/- 1.0 Consistent within 1.0
17	Front Door to B-Pillar	4.5 +/- 1.0 Parallel within 1.0	Door U/F 0.2 at bottom front +/- 1.0 Transition to 0.0 at rear +/- 1.0 Consistent within 1.0
18	Cowl End Cap to Windshield Frame	4.7 at inboard +/- 1.5 Transition to 6.5 to 4.7 at rear +/- 1.5 Parallel within 1.5	End Cap U/F 1.0 at front +/- 1.5 Transition to 1.7 to 0.1 at rear +/- 1.0 Consistent within 1.5
19	Fender Vent Bezel to Wheel Flare	1.4 at top +0.9 /- 0.8 Transition to 3.0 at	-

DIMENSION	DESCRIPTION	GAP	FLUSH
		bottom +0.9 /- 0.8 Parallel within 0.9	
20 (Sport 32" Flare)	Side Marker Lamp to Fender Flare	1.0 +/- 1.0 Parallel within 1.0	Lamp U/F 5.4 at upper front +/- 1.0 Transition to 4.2 at upper rear +/- 1.0 Consistent within 1.0
20 (BUX 32" Flare)	Side Marker Lamp to Fender Flare	1.3 at upper +/- 1.0 Transition to 1.0 at rear to 1.2 at lower front +/- 1.0 Parallel within 1.0	Lamp U/F 5.4 at upper front +/- 1.0 Transition to 4.2 at upper rear +/- 1.0 Consistent within 1.0
20 (35" Flare)	Side Marker Lamp to Fender Flare	1.0 +/- 1.0 Parallel within 1.0 Transition to 1.4 upper rear	Lamp U/F 3.9 at upper front +/- 1.0 Transition to 5.0 at upper rear +/- 1.0 Consistent within 1.0
21 (32" Flare)	Daytime Running Lamp to Fender Flare	1.0 +/- 1.0 Parallel within 1.0	Lamp U/F 5.0 at inboard upper +/- 1.0 Transition to 5.2 at outboard upper +/- 1.0 12.0 at inboard lower Transition to 5.0 at inboard upper +/- 1.0 Consistent within 1.0
21 (35" Flare)	Daytime Running Lamp to Fender Flare	1.0 +/- 1.0 at upper Transition to 1.2 inboard Parallel within 1.0	Lamp U/F 5.3 at inboard upper +/- 1.0 Transition to 3.9 at outboard upper +/- 1.0 15.2 at inboard lower Transition to 5.8 at inboard upper +/- 1.0 Consistent within 1.0
22	Center Chin Strap to Front Bumper Closeout	22.9 +/- 3.0 Transition to 22.7 outboard Parallel within 3.0	-
23	Outer Chin Strap to Hood	7.0 +/- 1.8 Transition to 7.4 +/- 1.4 at rear Parallel within 1.8 Side to side within 1.8	Chin Strap U/F 0.2 at front +/- 1.7 Transition to 0.4 +/- 1.7 at side Consistent within 1.7
24	Fender to Outer Chin Strap	12.4 at top +/- 1.7 Transition to 13.7 to 12.2 at bottom Parallel within 1.7	Fender O/F 0.5 +/- 1.5
25 (Base)	Box Side Cap to Tailgate Deflector	8.8 +/- 2.2 Parallel within 2.2	Box Side Cap U/F 0.3 +/- 2.2 at rear Transition to 0.0 +/- 2.2 at front Consistent within 2.2 side to side
25 (Tonneau)	Box Side Cap to Tailgate Deflector	7.8 +/- 2.2 Parallel within 2.2	Box Side Cap U/F 0.3 +/- 2.2 at rear Transition to 0.0 +/- 2.2

DIMENSION	DESCRIPTION	GAP	FLUSH
			at front Consistent within 2.2 side to side
26	Hard Top to Cab Back Panel	7.3 +/- 2.2 Parallel within 1.5	0.0 +/- 2.2 Consistent within 1.5
27	Hard Top to Backlite Glass	4.0 +/- 1.5 at inside of Glass Parallel within 1.5	-
28	Hard Top Left Panel to Hard Top Right Side Panel	8.0 +/- 1.8 Parallel within 1.8	0.0 +/- 2.0 Consistent within 2.0
29	Hard Top Front Panels to Hard Top	8.0 +/- 1.8 Parallel within 1.8	0.0 +/- 2.0 Consistent within 2.0
30	Windshield Frame to Door	4.5 +/- 1.5 Parallel within 1.5	Windshield Frame O/F 1.0 +/- 1.2 Consistent within 1.2
31	Cowl End Cap to Cowl Surround Panel	5.2 +/- 1.8 Parallel within 1.8	Cowl End Cap U/F 0.2 +/- 1.0
32	Wheel Flare to Front Fender	0.0 + 1.0	-
33	Cowl End Cap to Hood	5.0 +/- 1.5 Parallel within 1.5	0.0 + 2.5 /- 1.5 Consistent within 1.5
33 (BUX)	Cowl End Cap to Hood	5.0 +/- 1.5 Parallel within 1.5	Varies + 2.5 /- 1.5 Consistent within 1.5
34	Cowl End Cap to Fender	5.0 +/- 1.5 Parallel within 1.5	0.0 +/- 1.5 Consistent within 1.5
35	Fender to Front Door	4.5 +/- 1.1 Parallel within 1.1	Fender O/F 0.5 +/- 1.1 Consistent within 1.1
36	Cowl End Cap to Front Door	4.5 +/- 1.5 Parallel within 1.5	End Cap O/F 1.0 +/- 1.5 Transition to 0.5 +/- 1.5 at bottom Consistent within 1.5
37	Fender to Front Sill	5.0 +/- 1.0 Parallel within 1.0	0.0 +/- 1.0 Consistent within 1.0
38	Front Sill to B-Pillar	4.0 +/- 1.0 Parallel within 1.0	0.0 +/- 1.0 Consistent within 1.0
39	Rear Door to B-Pillar	4.5 +/- 1.0 Parallel within 1.0	Door U/F 0.5 +/- 1.0 at front Transition to 0.4 +/- 1.0 at bottom Consistent within 1.0
40	B-Pillar to Body Side Aperture	4.0 +/- 1.0 Parallel within 1.0	0.0 +/- 1.0 Consistent within 1.0
41	Hard Top to Body Side	Side Panel 6.7 +/- 1.5 Rear Panel 7.3 +/- 1.5 at side Transition to 7.8 +/- 1.5 at rear Parallel within 1.5	Hard Top O/F 0.7 +/- 1.7 at rear Transition to 0.0 +/- 1.7 at side Consistent within 1.5
41	Soft Top to Body Side	1.0 +/- 1.5 at side Transition to 1.5 +/- 1.5 at rear Parallel within 1.5	Soft Top U/F 8.0 +/- 1.5 at front Transition to 6.5 +/- 1.5 across rear Consistent within 1.5

DIMENSION	DESCRIPTION	GAP	FLUSH
42	Rear wheel Flare to Body Side	23.6 +/- 4.0 at top Transition to 23.1 to 25.2 +/- 4.0 at bottom	-
43	Box Side to Tailgate	4.0 +/- 1.5	Box Side U/F 0.1 +/- 1.4 Consistent within 1.2 Side to Side 1.2
44 (Sport)	Rear Bumper to Tailgate	30.0 +/- 3.5 at inboard Parallel within 3.5	-
44 (Rubicon)	Rear Bumper to Tailgate	30.0 +/- 3.5 at inboard Parallel within 3.5	-
45	Tow Hook to Rear Bumper	43.5 +/- 3.7 Parallel within 4.1	-
46	Rear Bumper to Box	29.5 +/- 3.5 Parallel within 3.5	-

DECKLID/HATCH/LIFTGATE/TAILGATE/SWING GATE

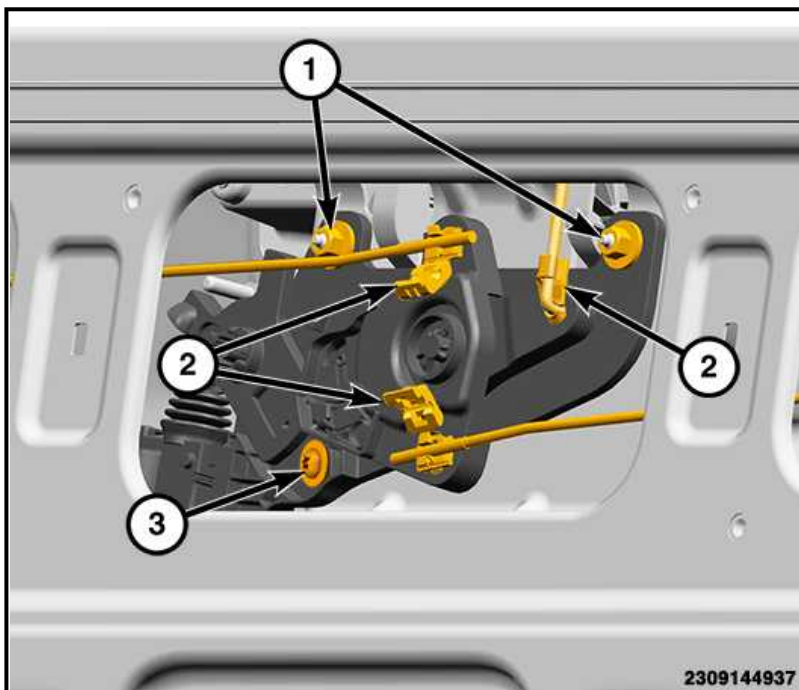
ACCUATOR, LATCH

REMOVAL AND INSTALLATION

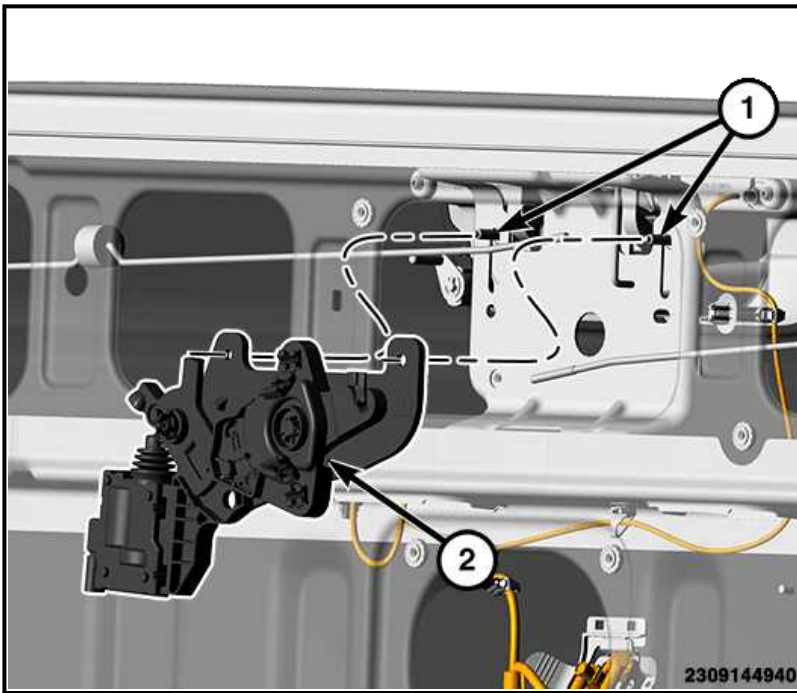
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the covers as needed. Refer to [COVER, TAILGATE, REMOVAL AND INSTALLATION](#).



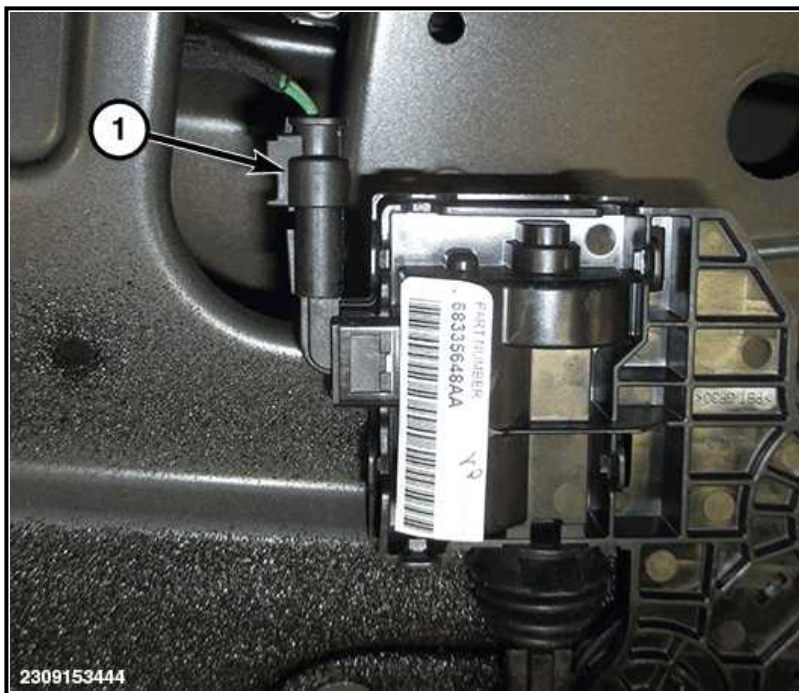
3. Release the clips (2) and separate the links from the control assembly.
4. Remove the fastener (3).
5. Remove the nuts (1).



6. Remove the control assembly (2) from the handle studs (1).

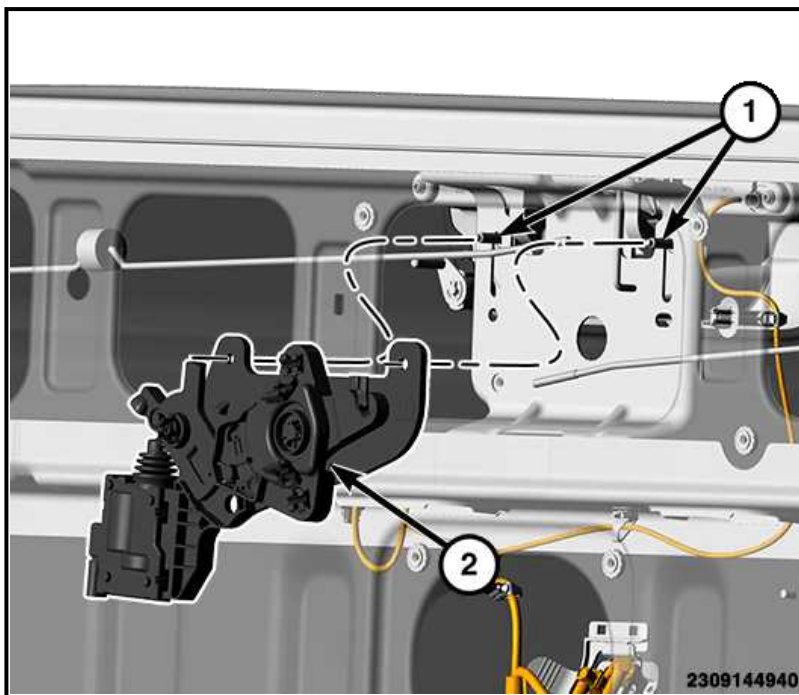


7. Disconnect the control assembly wire harness connector (1).

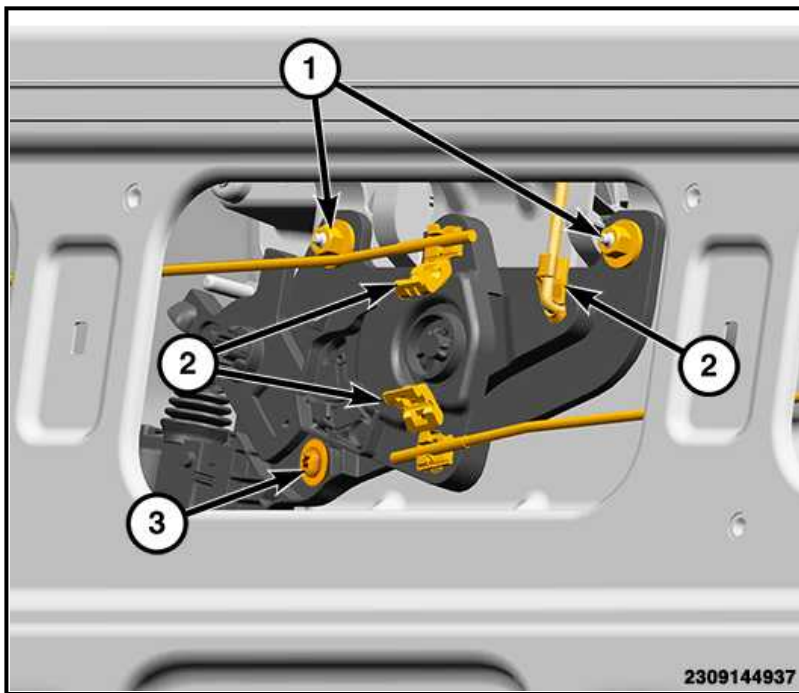


INSTALLATION

1. Connect the wire harness connector (1).



2. Install the control assembly (2) into the front of the tailgate onto the handle studs (1).

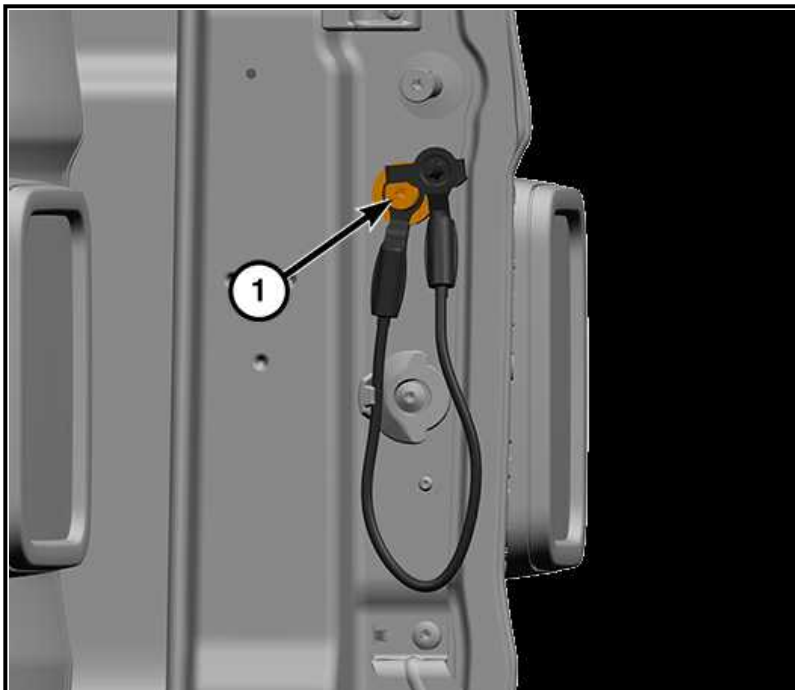


3. Install the nuts (1) and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#) .
4. Install the fastener (3) and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#) .
5. Install the control rods onto the control assembly and seat the clips (2) fully.
6. Install the covers as needed. Refer to [COVER, TAILGATE, REMOVAL AND INSTALLATION](#).
7. Connect the negative battery cable(s). Refer to the appropriate service information .

CABLE, TAILGATE

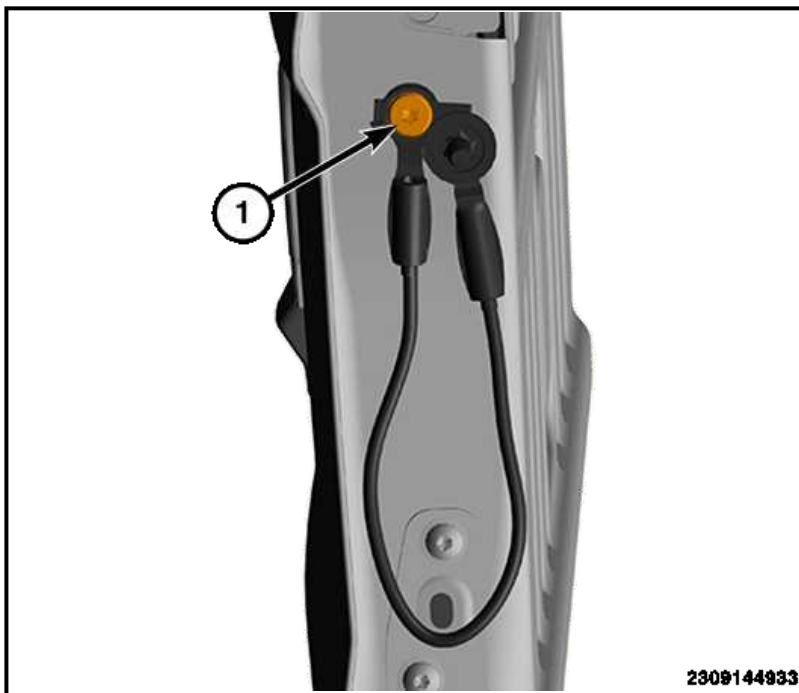
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Open the tailgate and locate the tailgate check cable on the left and right of the cargo box below the tailgate striker as necessary.
2. Remove the bolt (1) and remove the tailgate check cable(s) from the cargo box.

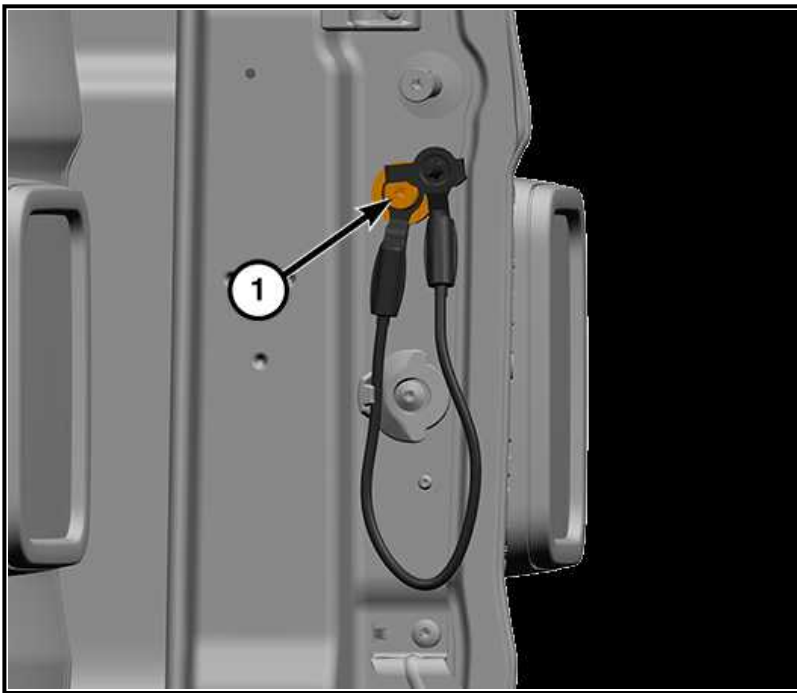


3. Remove the bolt (1) that secures the tailgate check cable to the left and right side of the tailgate.
4. Remove the tailgate check cable(s) from the tailgate.



INSTALLATION

1. Position the tailgate check cable onto the left and right side of the tailgate as necessary.
2. Install the bolt (1) that secures the small end of the tailgate check cable(s) to the tailgate and tighten to the proper Refer to **TORQUE SPECIFICATIONS** .

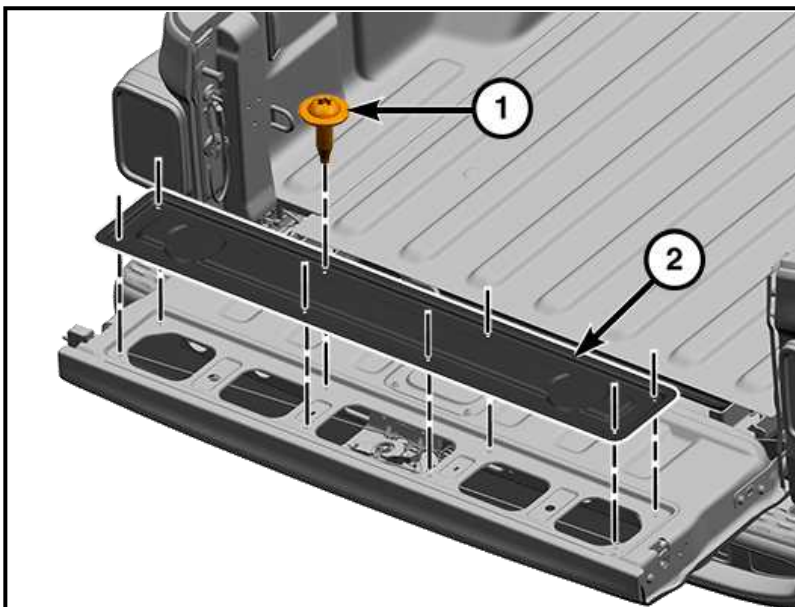


3. Position the tailgate check cable to the left and right side of the cargo box below the tailgate striker as necessary.
4. Install the bolt (1) attaching the cable to the cargo box and tighten to the proper Refer to **TORQUE SPECIFICATIONS**.

COVER, TAILGATE

REMOVAL AND INSTALLATION

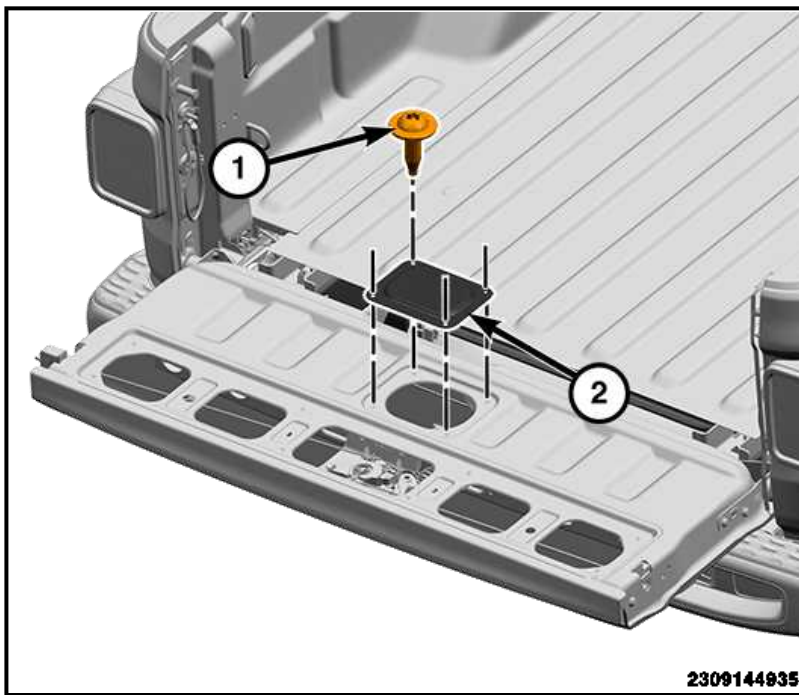
REMOVAL AND INSTALLATION



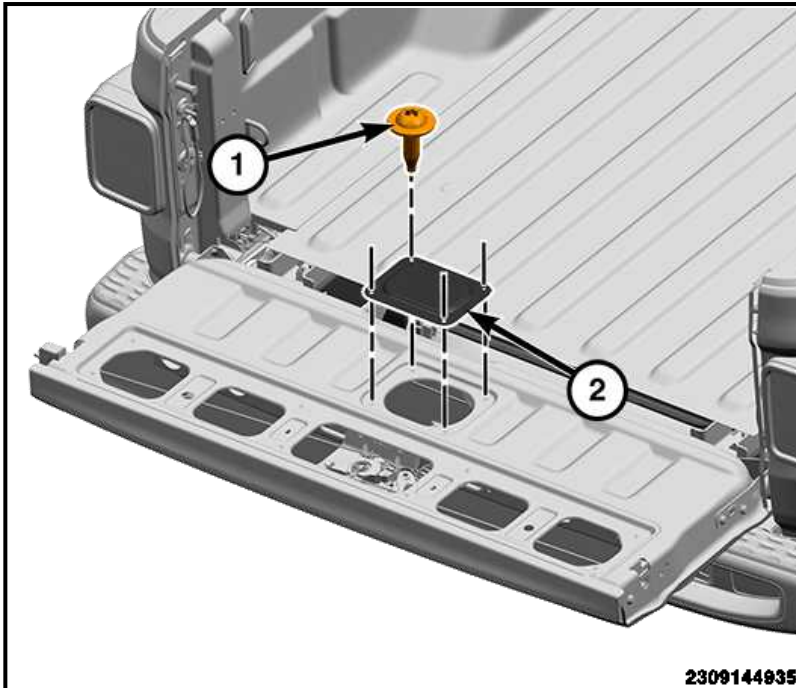
2309144934

REMOVAL

1. Open the tailgate.
2. Remove the fasteners and remove the tailgate liner, if equipped with a bed liner.
3. Remove the eight fasteners (1) that secure the tailgate cover (2) to the inside of the tailgate and remove the cover.

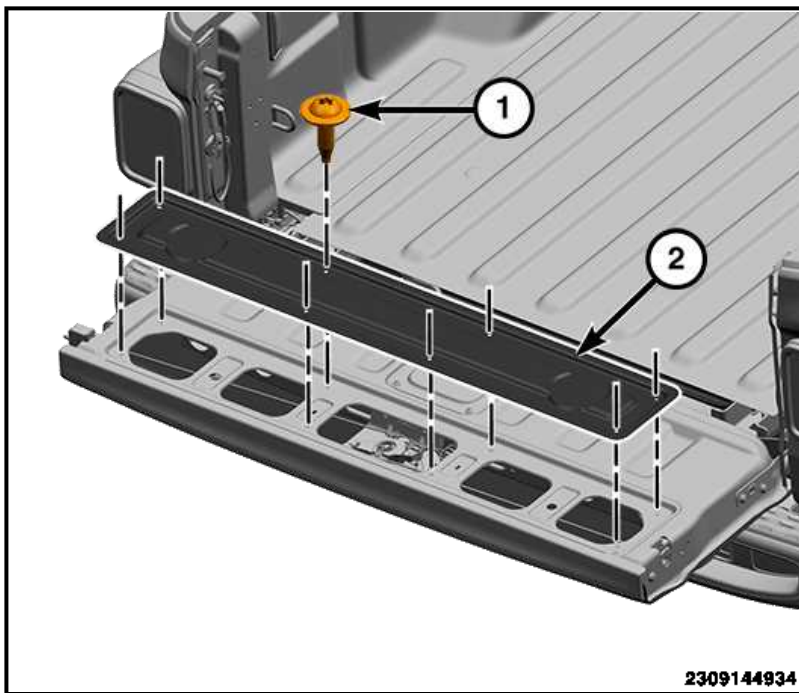


4. Remove the four fasteners (1) that secure the lower tailgate cover (2) to the inside of the tailgate and remove the cover.



INSTALLATION

1. Position the tailgate cover (2) and install the four fasteners (1).
2. Tighten the fasteners (1) to the proper Refer to [TORQUE SPECIFICATIONS](#) .

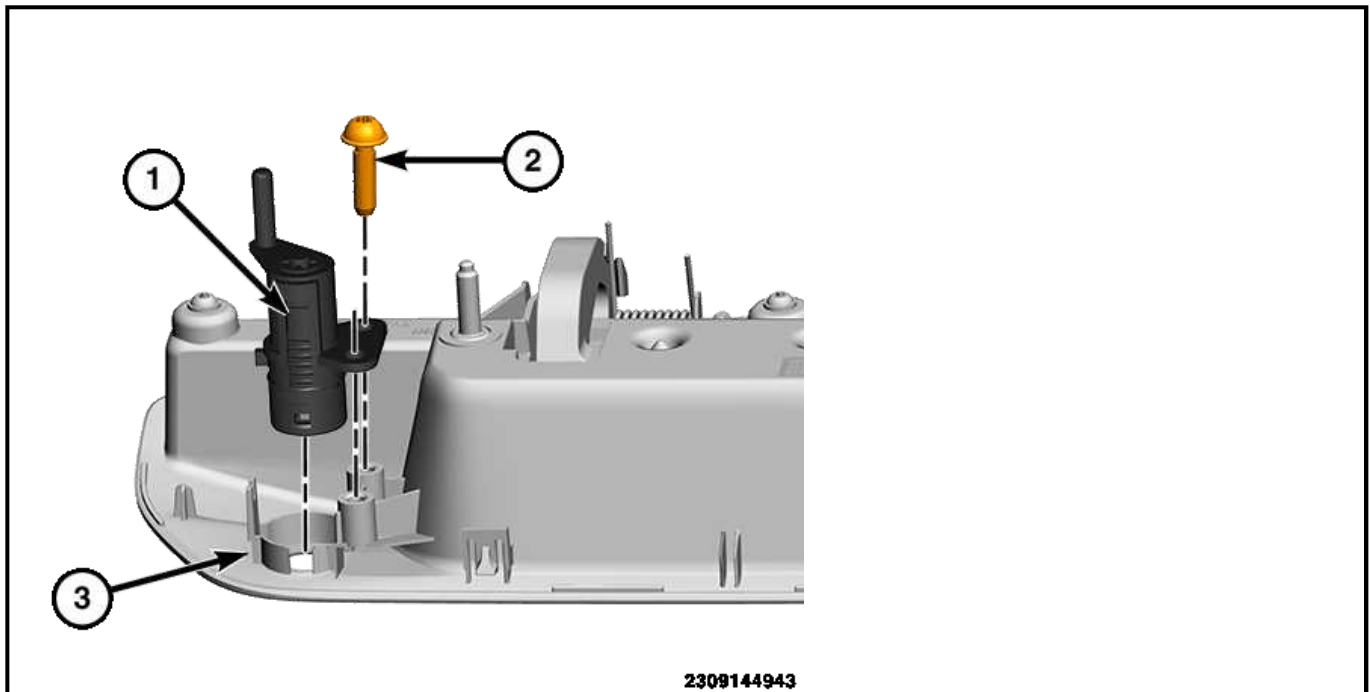


3. Position the tailgate cover (2) and install the eight fasteners (1).
4. Tighten the fasteners to the proper Refer to [TORQUE SPECIFICATIONS](#) .
5. On vehicles equipped with a bed liner, position the tailgate liner to the tailgate.
6. Insert the fasteners and tighten securely.

CYLINDER, LOCK

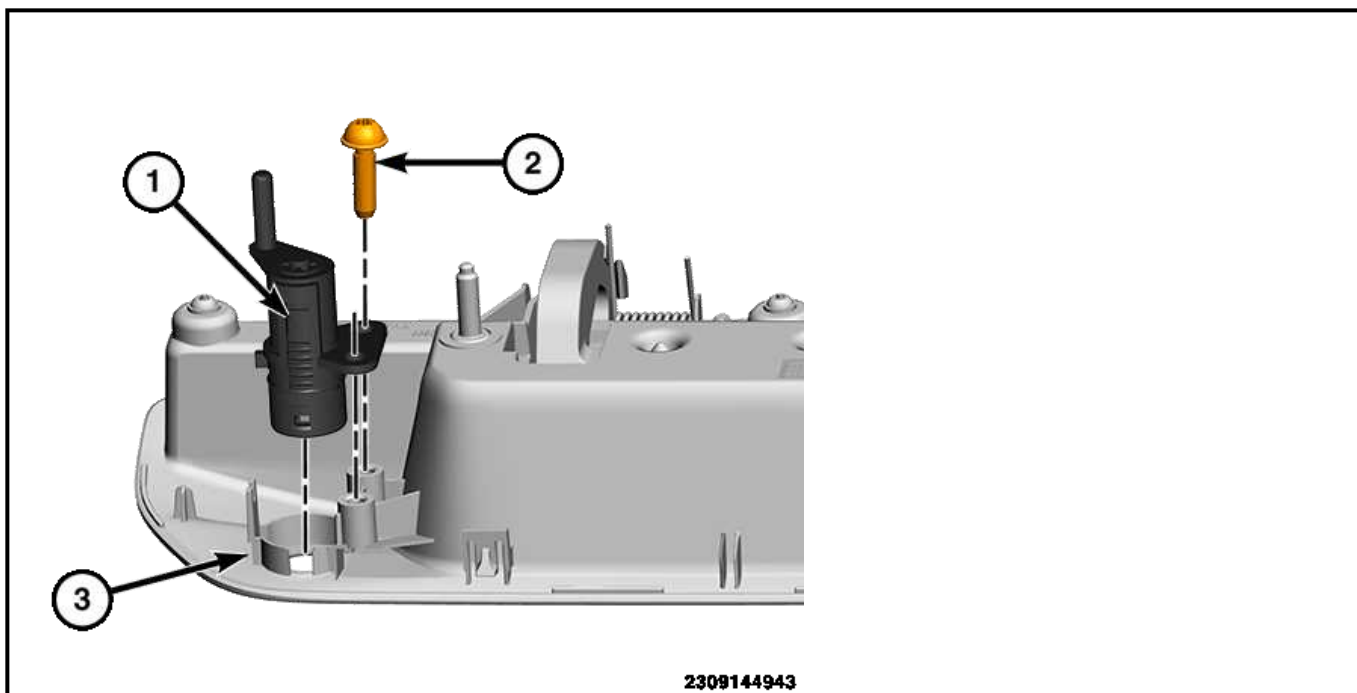
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Remove the exterior handle Refer to [HANDLE, LATCH RELEASE, REMOVAL AND INSTALLATION](#).
2. Remove the screws (2) and remove the lock cylinder (1) from the handle (3).



2309144943

INSTALLATION

1. Install the lock cylinder (1) onto the handle assembly (3) and install the screws (2).
2. Tighten the screws to the proper Refer to [TORQUE SPECIFICATIONS](#) .
3. Install the exterior handle Refer to [HANDLE, LATCH RELEASE, REMOVAL AND INSTALLATION](#).

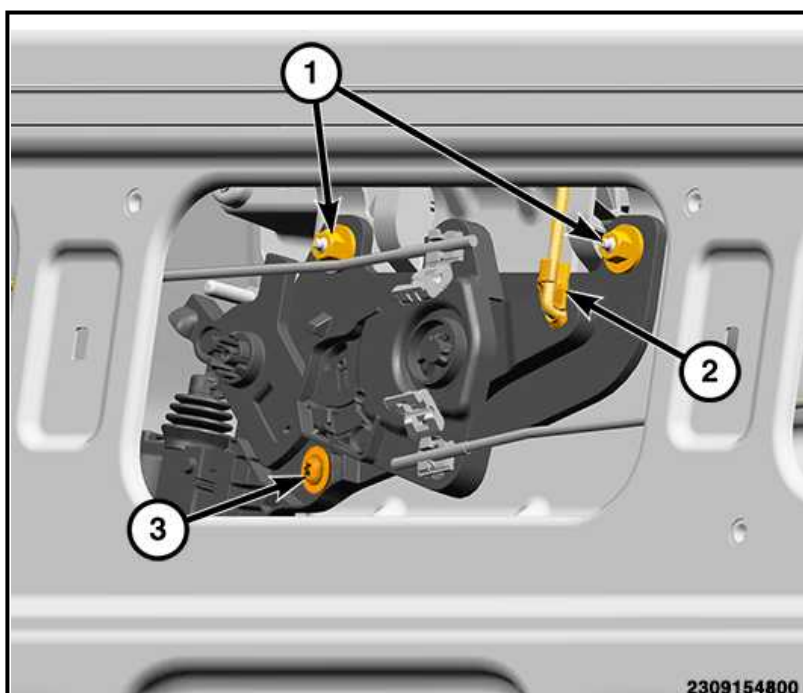
HANDLE, LATCH RELEASE

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

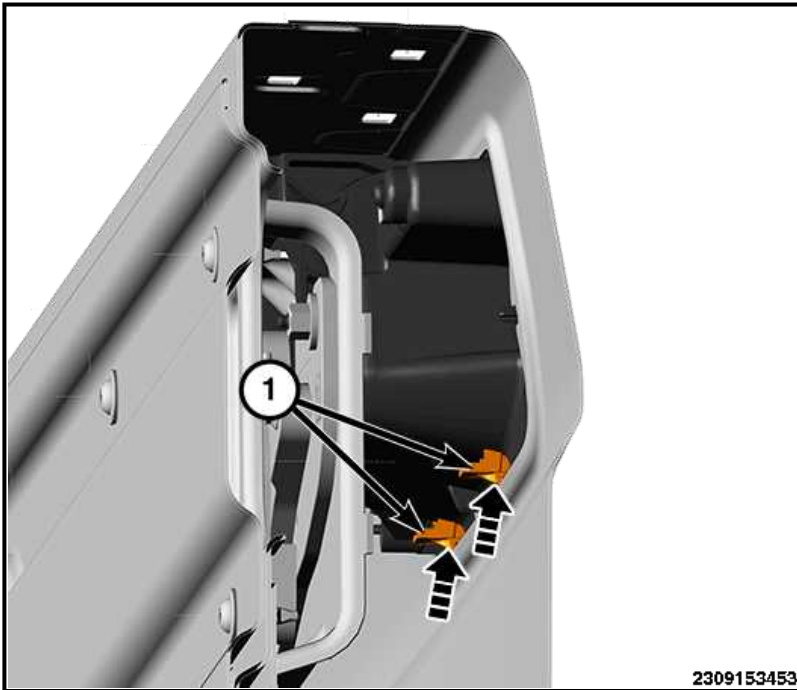
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the covers as needed Refer to [COVER, TAILGATE, REMOVAL AND INSTALLATION](#).

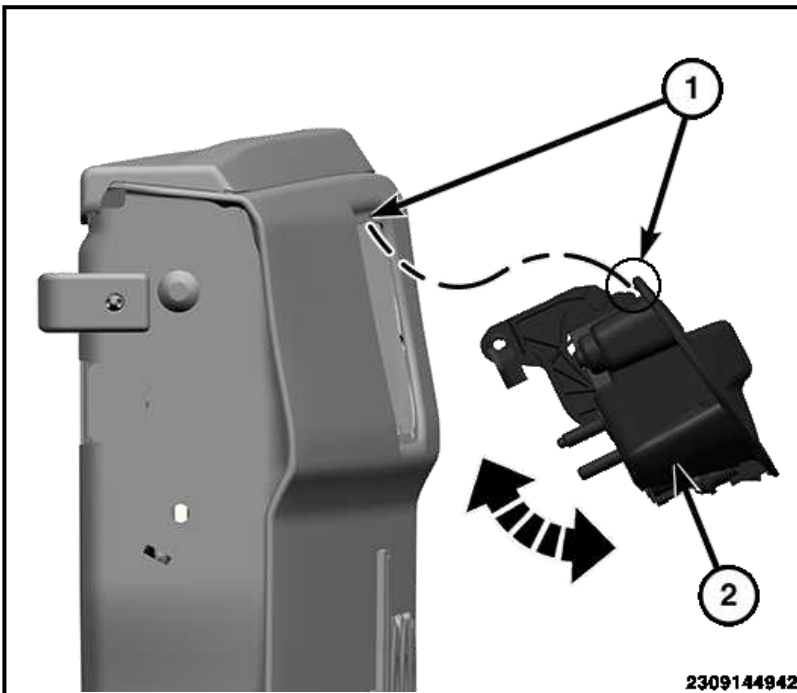


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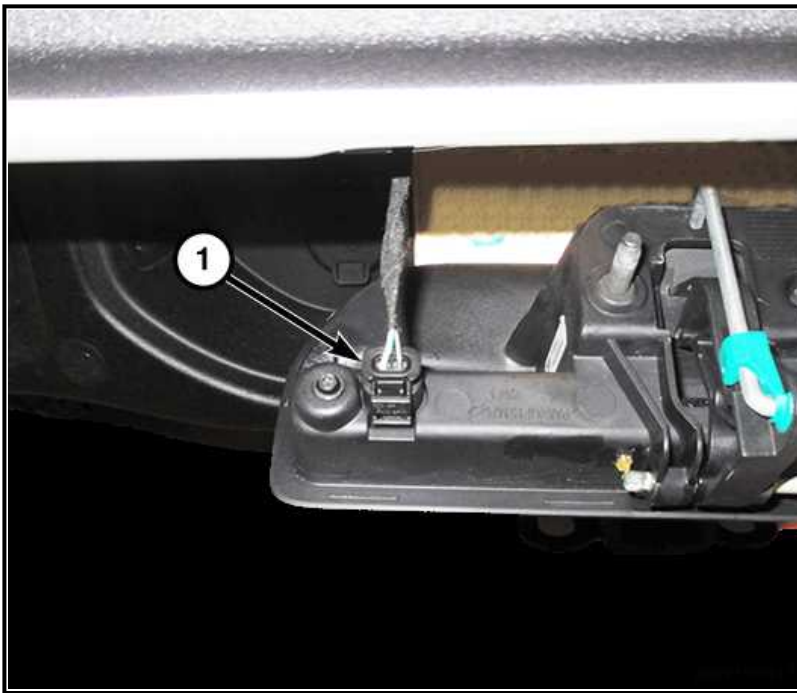
3. Release the clip (2) and separate the link from the actuator assembly.
4. Remove the fastener (3)
5. Remove the nuts (1) and separate the actuator.



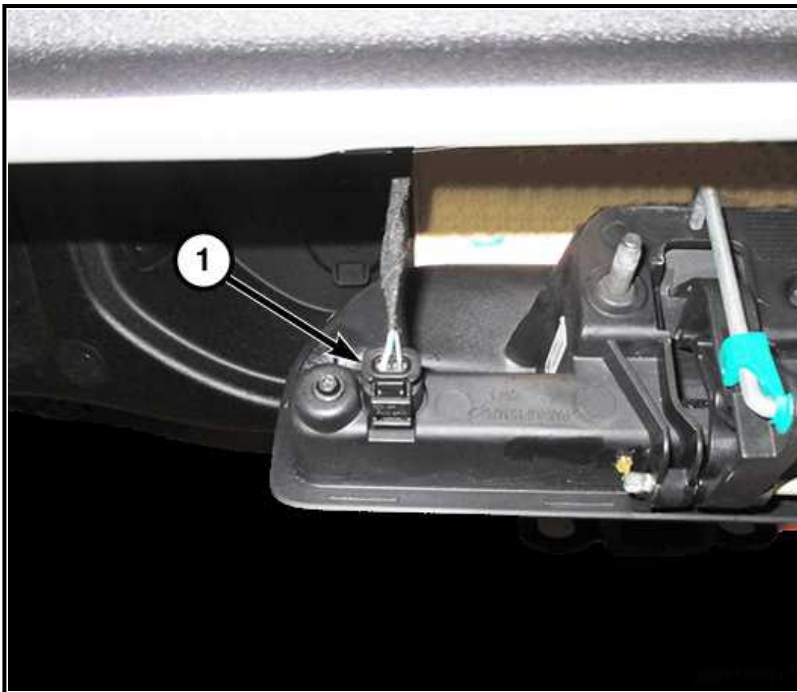
6. From inside the tailgate, release the lower clips (1) to release the handle from the outer skin of the tailgate.



7. Pull the handle assembly out and release the upper tabs (1).
8. Remove the handle assembly (2).

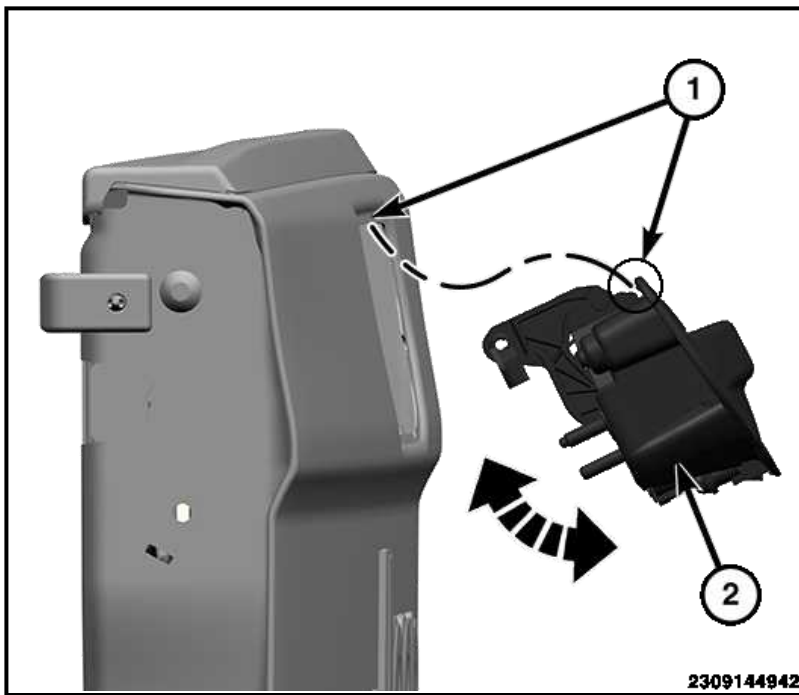


9. Disconnect the center high mounted tail light wire harness connector (1).

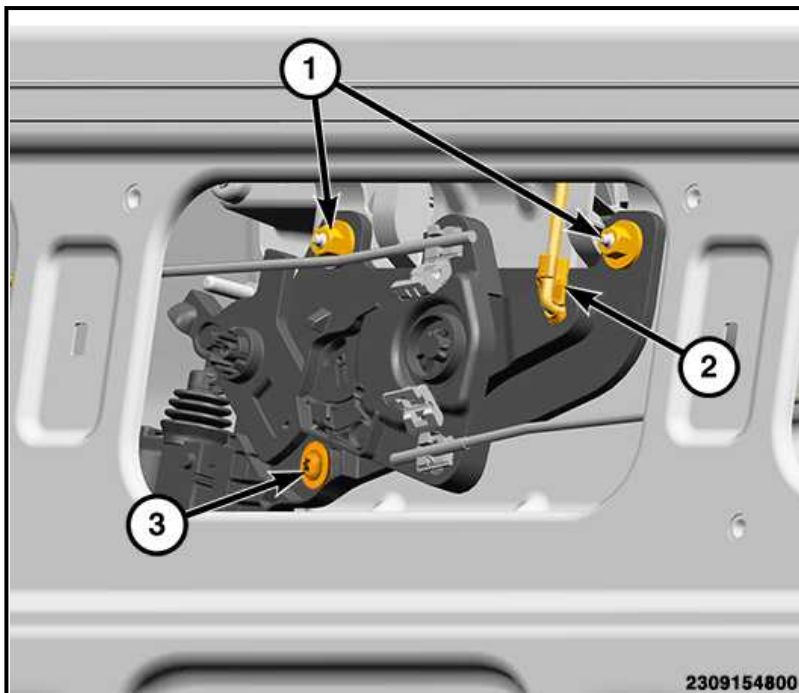


INSTALLATION

1. Connect the center high mounted tail light wire harness connector (1).



2. Install the handle assembly (2) into the tailgate at a 45 degree angle and seat the upper tabs (1) fully.
3. Seat the handle assembly (2) into the tailgate at the bottom fully.



4. Position the actuator back into place.
5. Install the nuts (1) and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#) .
6. Install the fastener (3) and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#) .
7. Install the control rod onto the actuator assembly and seat the clip (2) fully.
8. Install the covers as needed Refer to [COVER, TAILGATE, REMOVAL AND INSTALLATION](#).
9. Connect the negative battery cable(s). Refer to the appropriate service information .

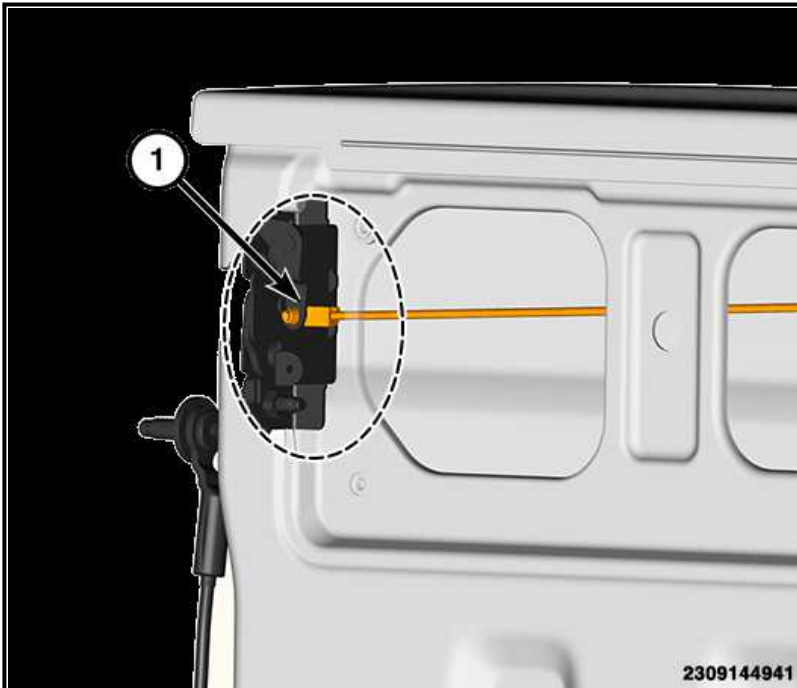
LATCH

REMOVAL AND INSTALLATION

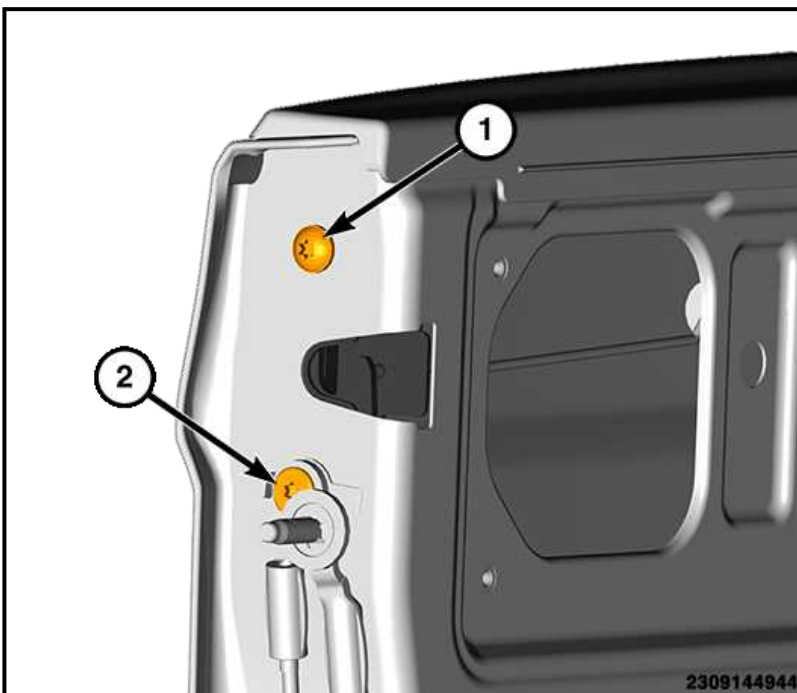
REMOVAL AND INSTALLATION

REMOVAL

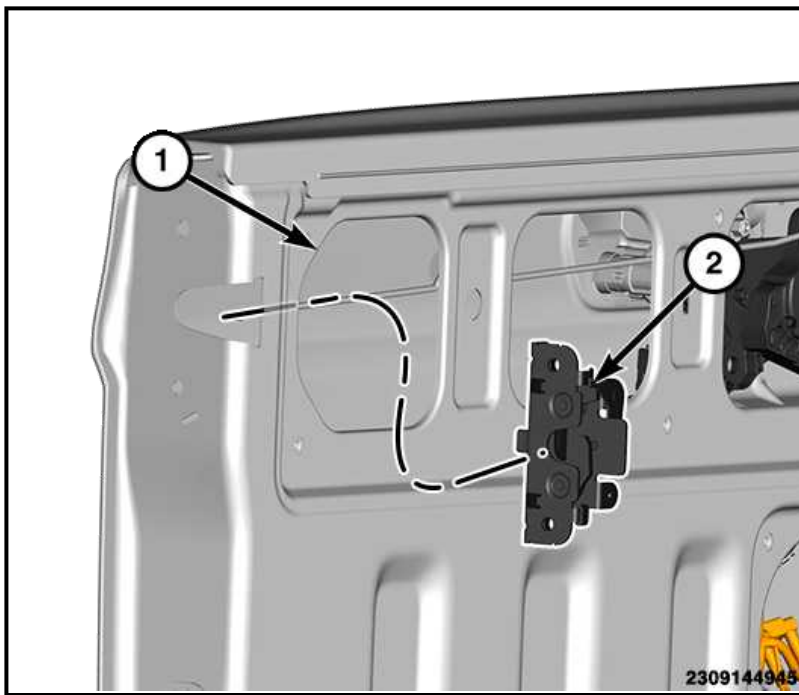
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the tailgate cover Refer to [COVER, TAILGATE, REMOVAL AND INSTALLATION](#).



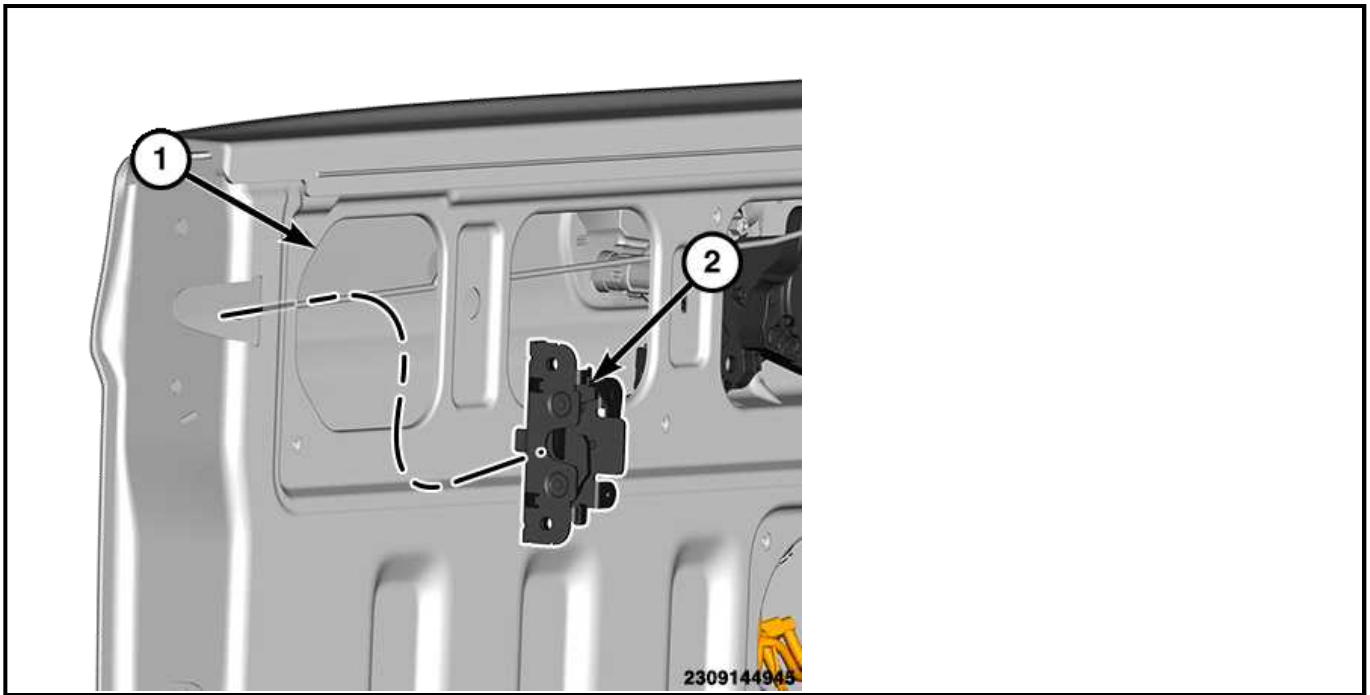
3. Disconnect the control link (1) from the latch being serviced.



4. Remove the bolts (1 and 2) that secure the latch to the tailgate and position the tailgate check cable out of the way.

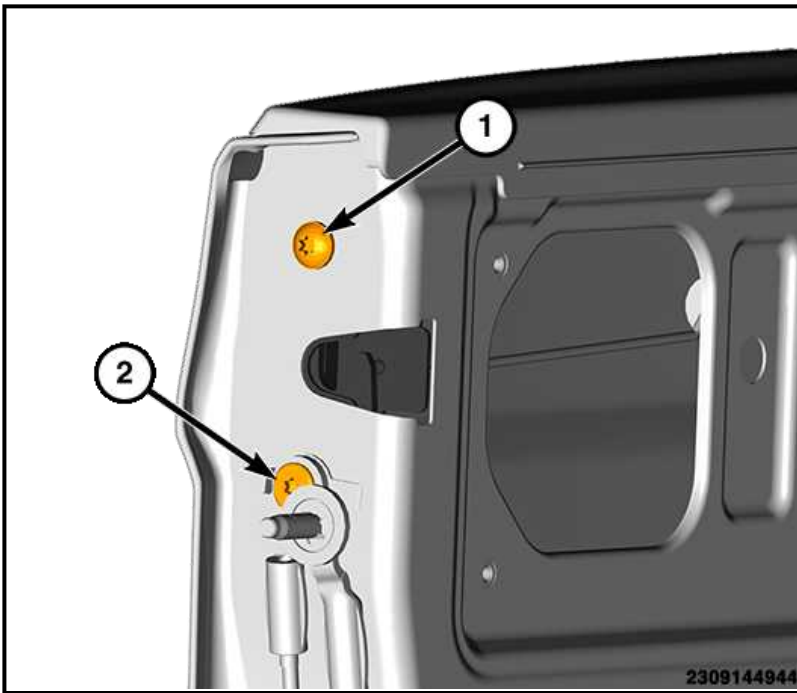


5. Remove the latch (2) from the tailgate (1).

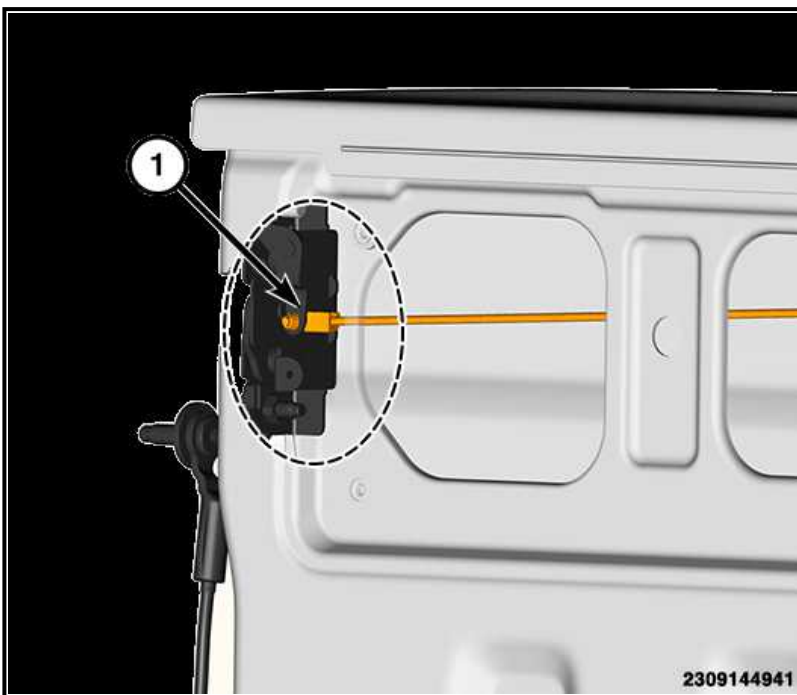


INSTALLATION

1. Loosely assemble the latch (2) to the tailgate (1).



2. Install the cable and anchor bolt (2) to the latch.
3. Install the bolt (1) securing the latch.
4. Tighten the fasteners to the proper Refer to [TORQUE SPECIFICATIONS](#) .



5. Connect the control link (1) to the latch and seat the clip fully.
6. Install the tailgate cover Refer to [COVER, TAILGATE, REMOVAL AND INSTALLATION](#).
7. Connect the negative battery cable(s). Refer to the appropriate service information .

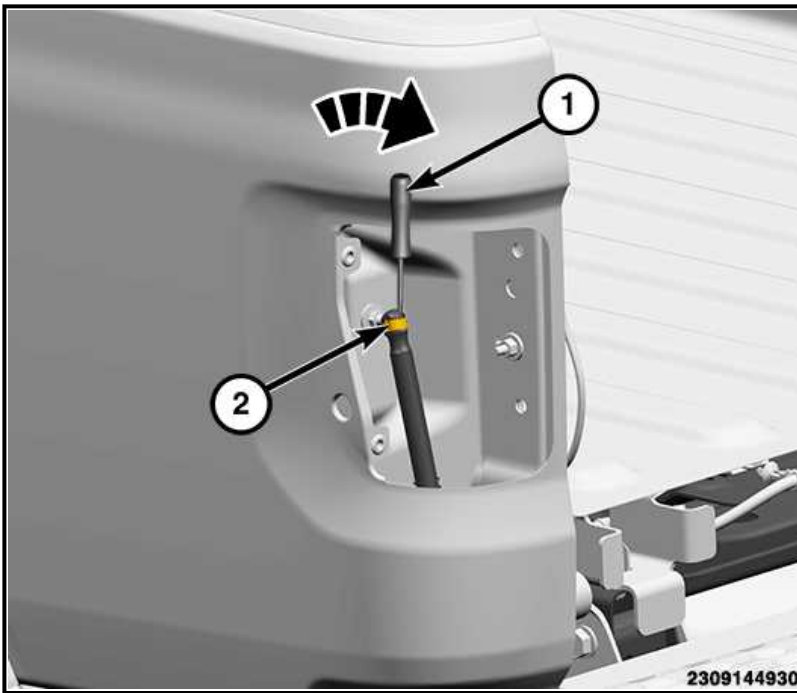
PROP, GAS

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

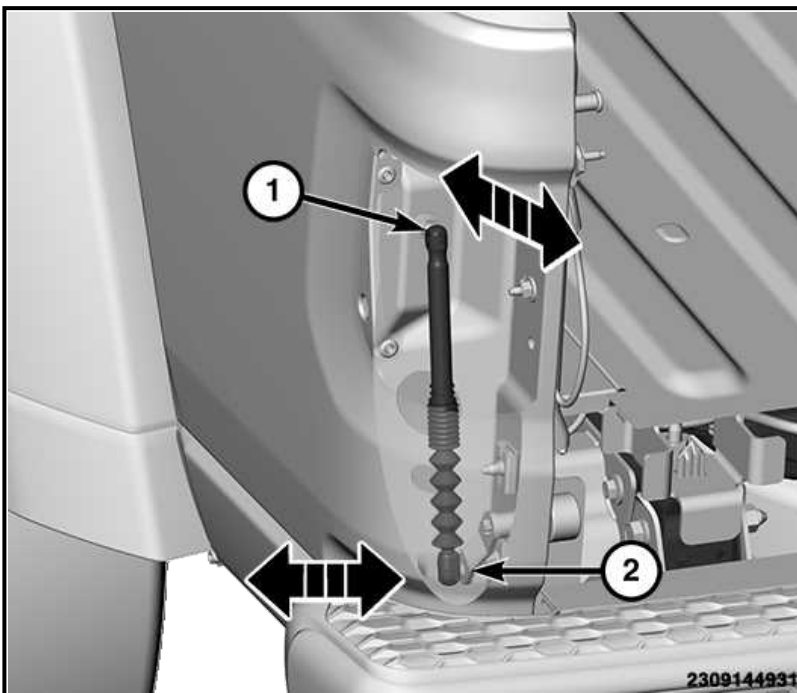
REMOVAL

1. Remove the tail lamp unit Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .

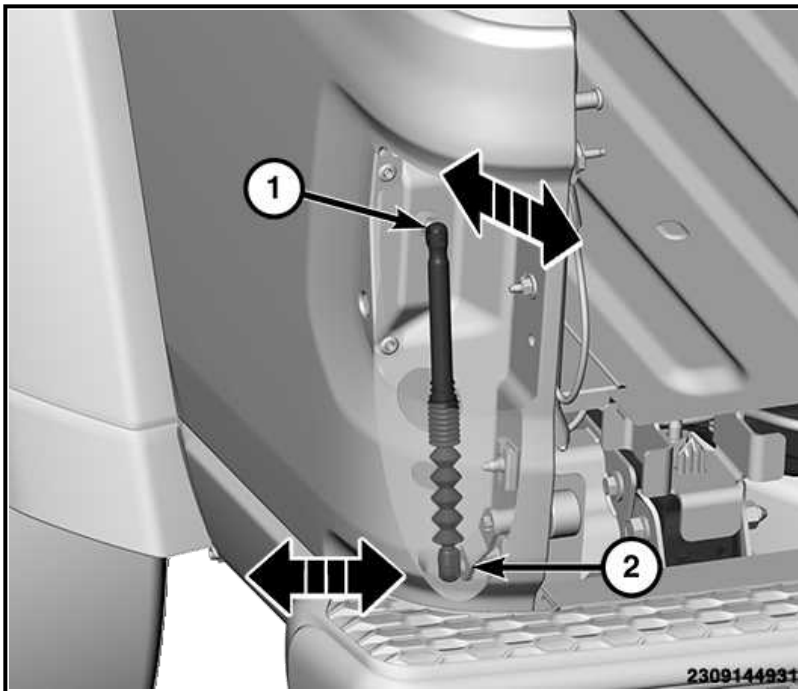


2. Using a small flat bladed tool (1) or equivalent, release the retaining clip (2) while pulling the ball socket away from the ball stud.

NOTE: Release the clip (2) only enough to release the ball socket.



3. Remove the support cylinder from the upper (1) and lower (2) ball studs.



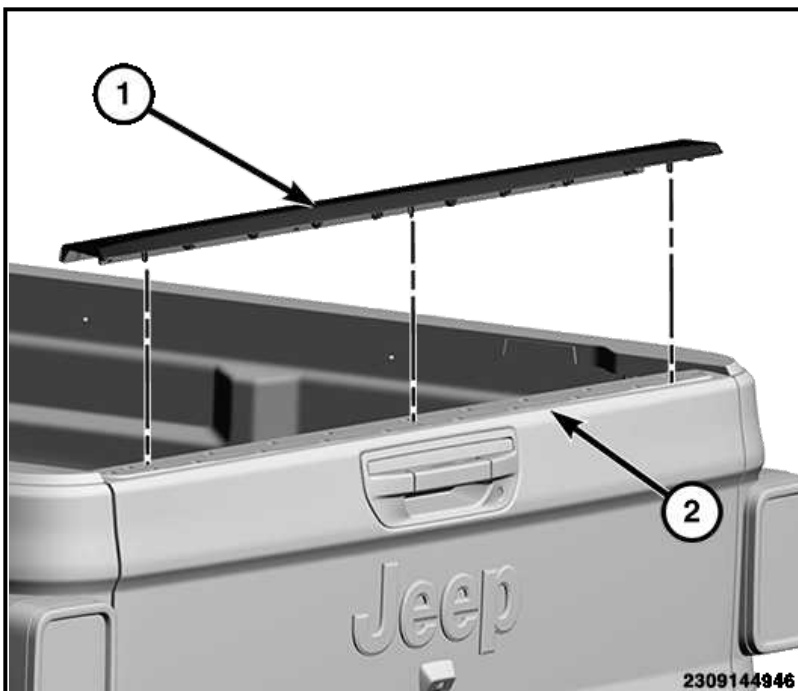
INSTALLATION

1. Make sure the retaining clips are seated into the ball sockets fully.
2. Install the support cylinder over the upper (1) and lower (2) ball studs with the thin end connected to the lower ball stud and the retaining clips snapping into place fully.
3. Install the tail lamp unit Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .

SPOILER

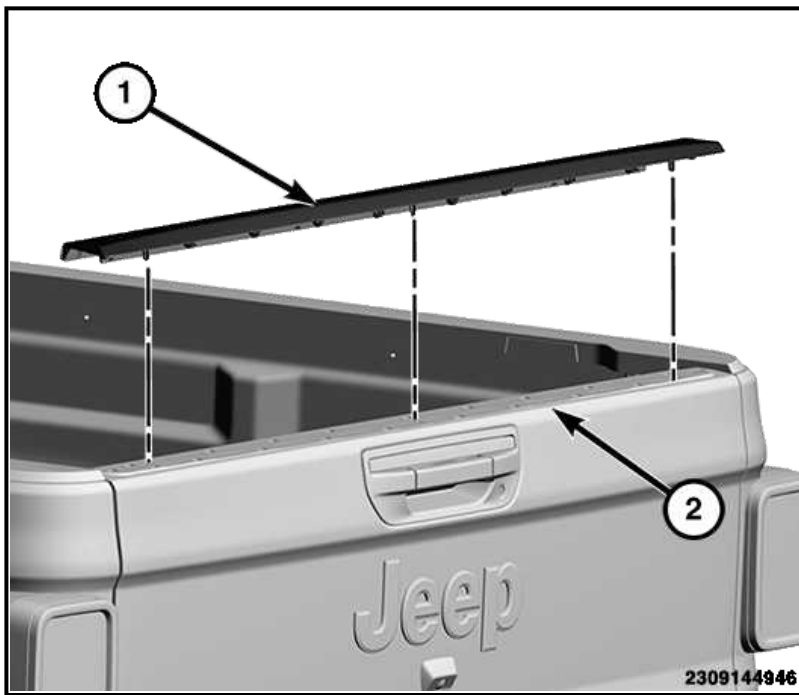
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Using trim stick (special tool #C-4755, Trim Stick) or equivalent, release the retaining clips and remove the spoiler (1) from the tailgate (2).



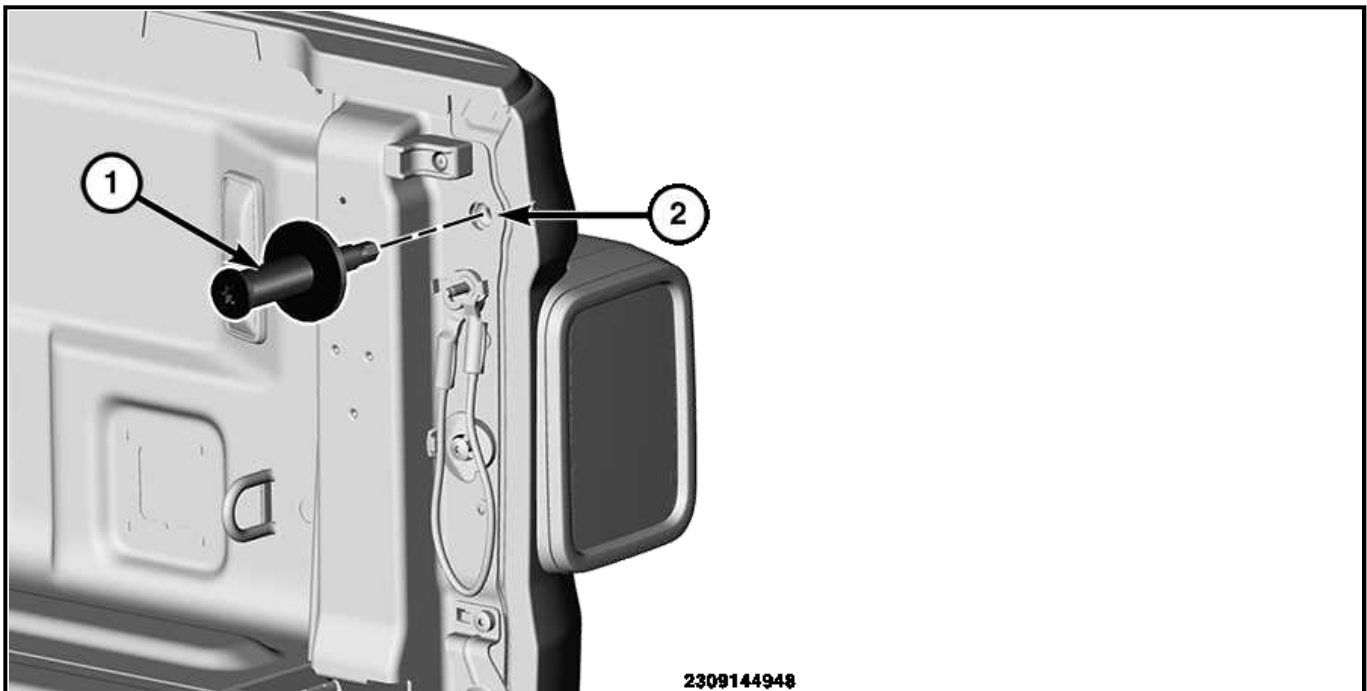
INSTALLATION

1. Position the spoiler (1) to the holes in the top of the tailgate (2).
2. Insert the locating pin into the center of the tailgate top and line up the retaining clips into the holes.
3. Working from the center outward, tap the retaining clips into the holes until fully secured.

STRIKER, LATCH

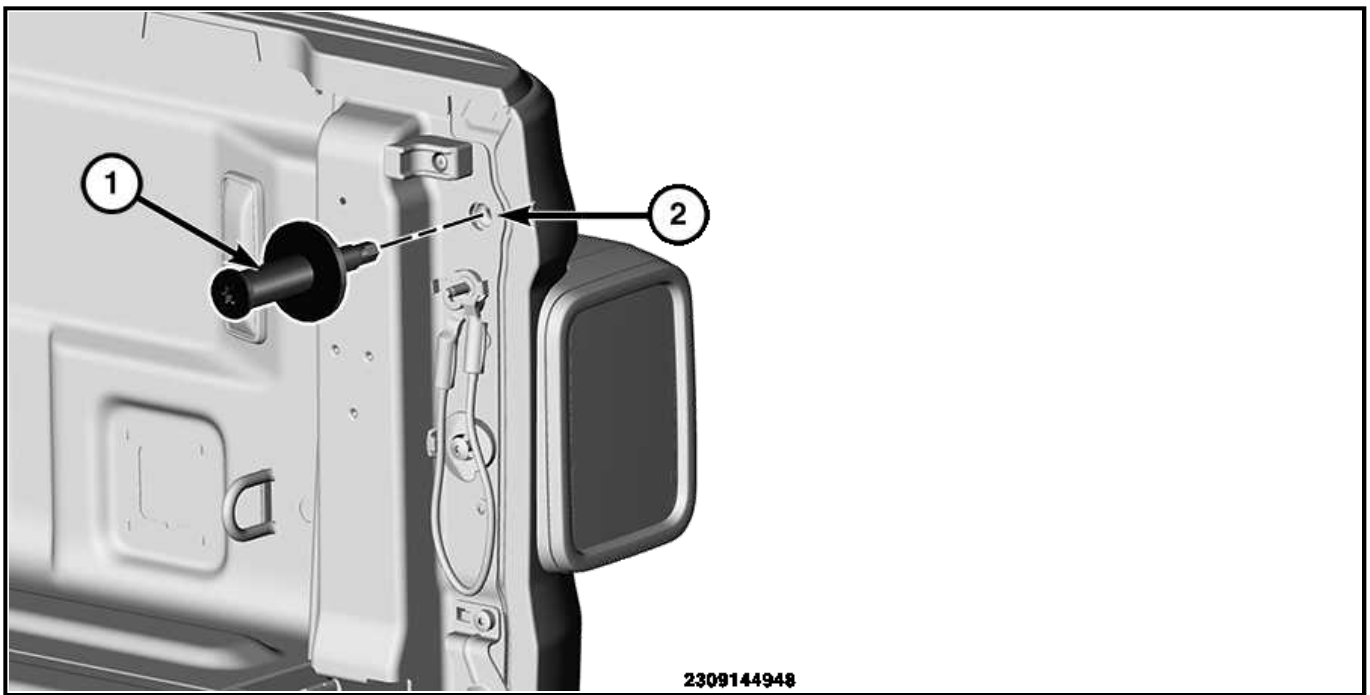
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Open the tailgate and using a grease pencil or equivalent, mark the location of the tailgate striker (1) being serviced.
2. Remove the tailgate striker from the cargo box (2).



INSTALLATION

1. Position the tailgate striker (1) to the cargo box (2) using the reference mark made during the removal procedure.
2. Tighten the tailgate striker to proper Refer to [TORQUE SPECIFICATIONS](#) .

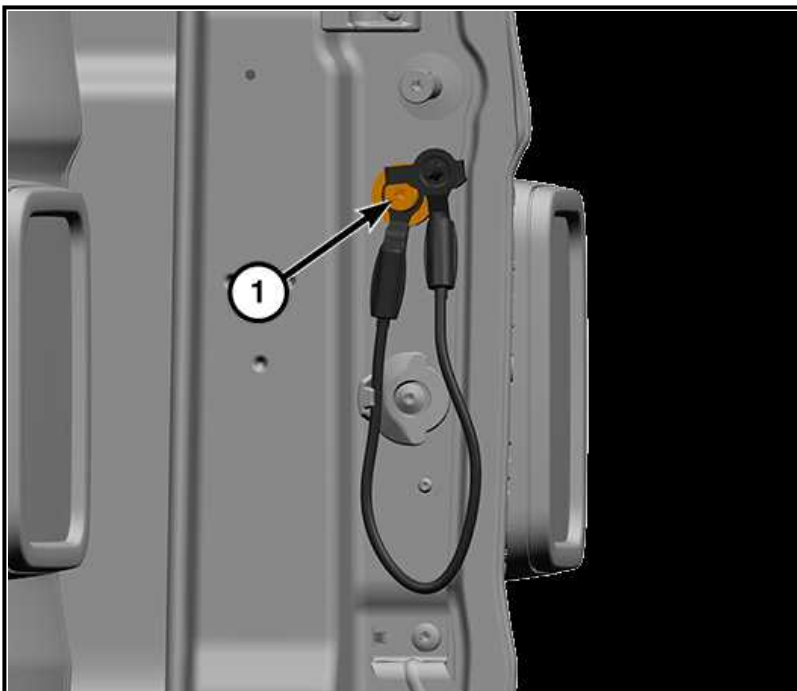
TAILGATE

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

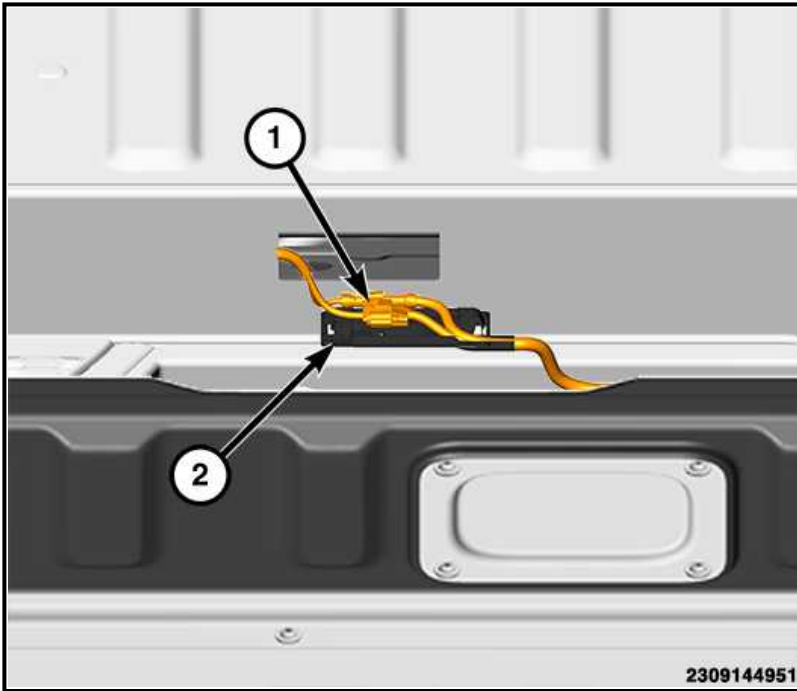
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



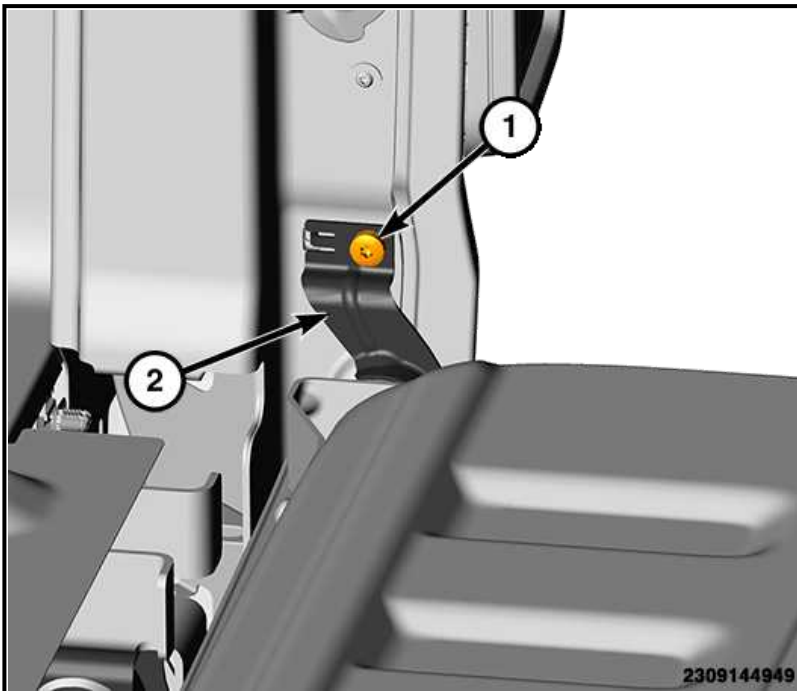
2. Open the tailgate and locate the tailgate check cable on the left and right of the cargo box below the tailgate striker as necessary.

3. Remove the bolts (1) and remove the tailgate check cable(s) from the cargo box.

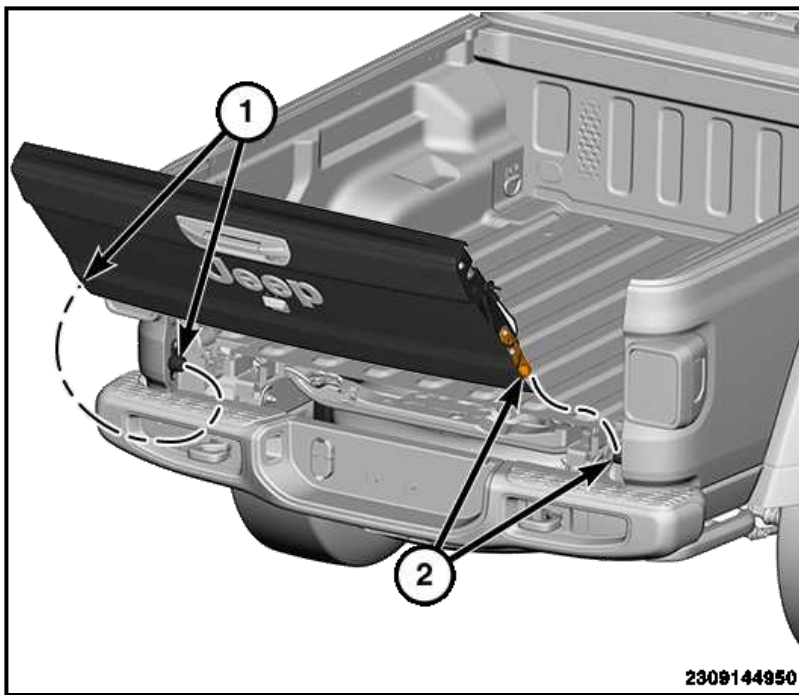


4. Using a trim stick or equivalent, separate the cover plate (2) from the rear cargo box sill panel.

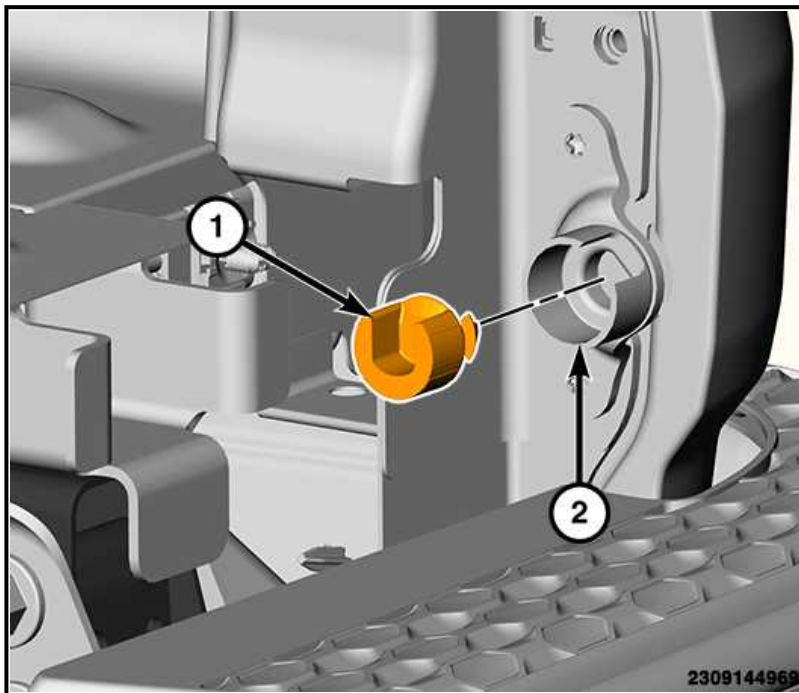
5. Disconnect the wire harness connectors (1), if equipped.



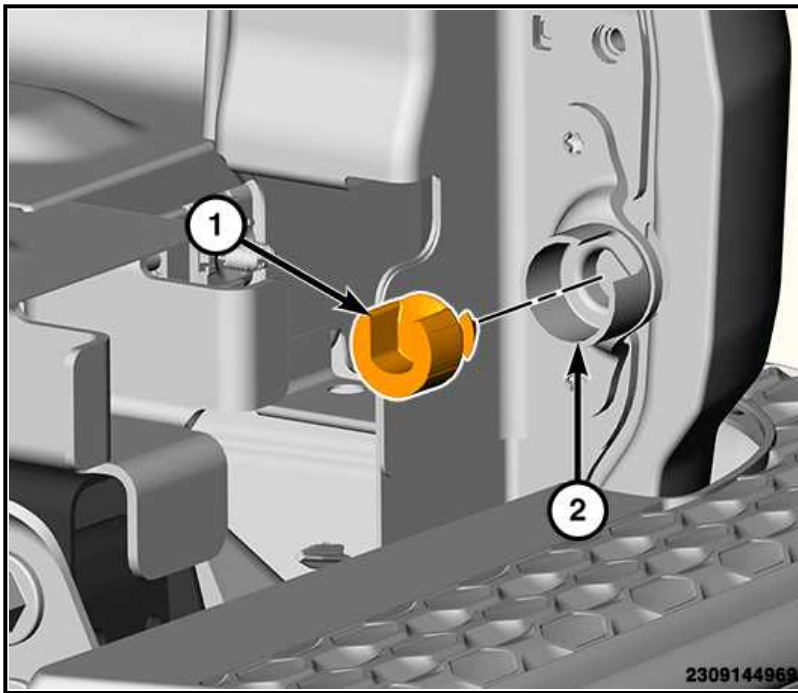
6. Remove the bolt (1) and remove the lock plate (2).



7. Partially close the tailgate so that the notch in the right side tailgate pivot pocket (2) aligns with the flats on the right side tailgate pivot pin.
8. Lift the tailgate upward far enough to disengage the tailgate pivot pocket from the right side tailgate pivot pin.
9. Carefully slide the tailgate to the right far enough to disengage it from the left side tailgate pivot pin (1) and remove the tailgate.

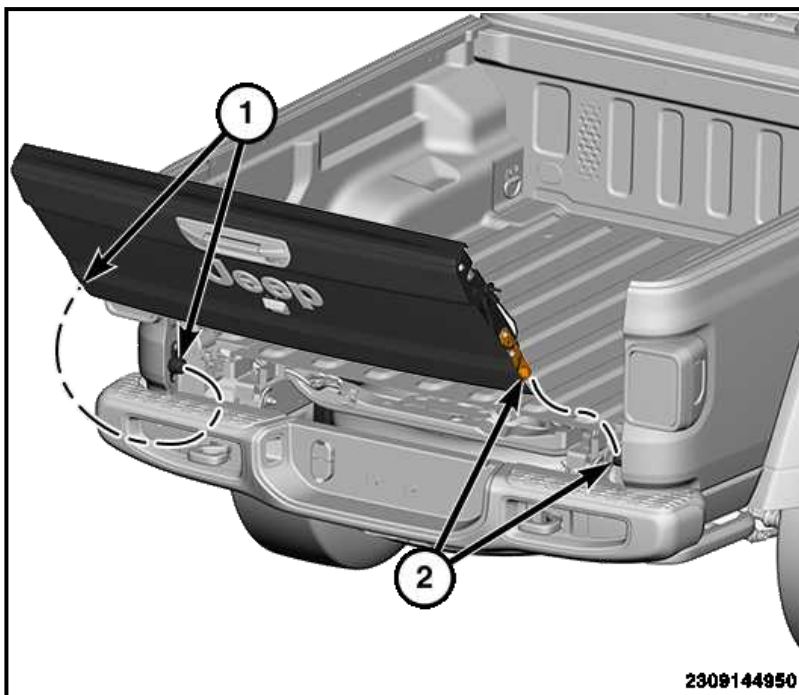


10. If required, remove the bushing (1) from each tailgate pivot pocket (2).

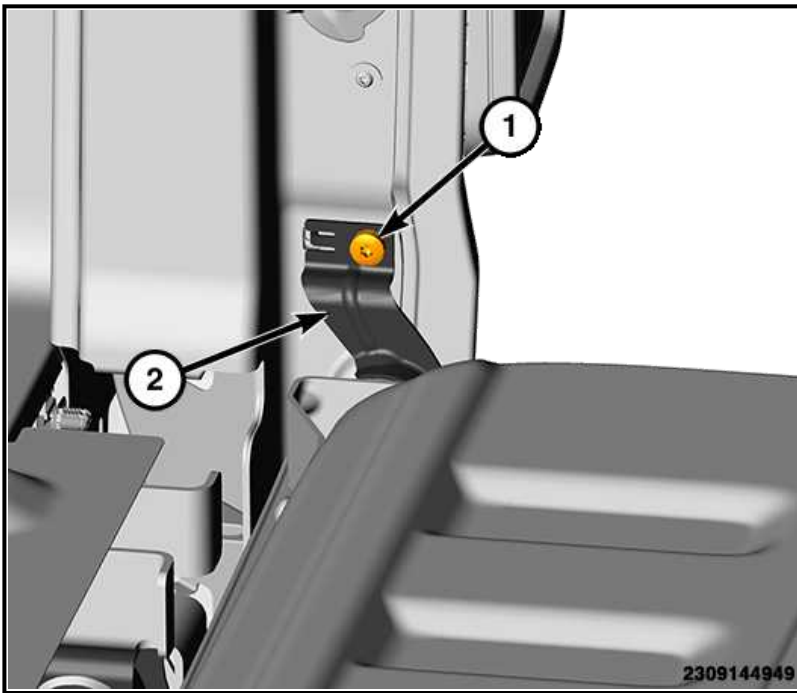


INSTALLATION

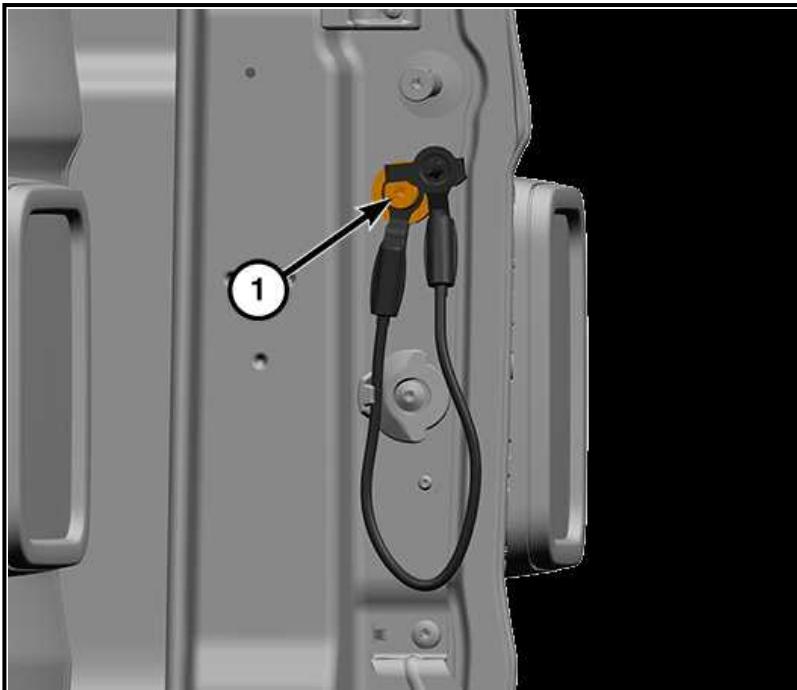
1. If removed, install the bushing (1) into each tailgate pivot pocket (2).



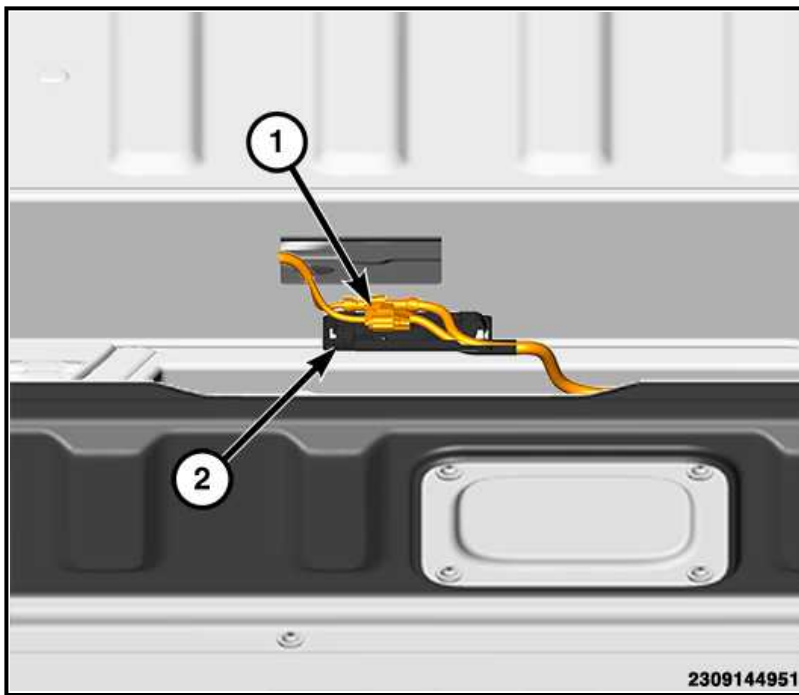
2. Position the tailgate to the left side tailgate pivot pin (1).
3. Partially close the tailgate so that the notch in the right side tailgate pivot pocket aligns with the flats on the right side tailgate pivot pin (2).
4. Lower the tailgate to the right side tailgate pivot pin (2).



5. Install the lock plate (2) and install the screw (1)
6. Tighten the screw (1) to the proper Refer to [TORQUE SPECIFICATIONS](#) .



7. Position the tailgate check cable onto the left and right side of the cargo box.
8. Install the bolts (1) that secure the tailgate check cable(s) to the box and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#) .

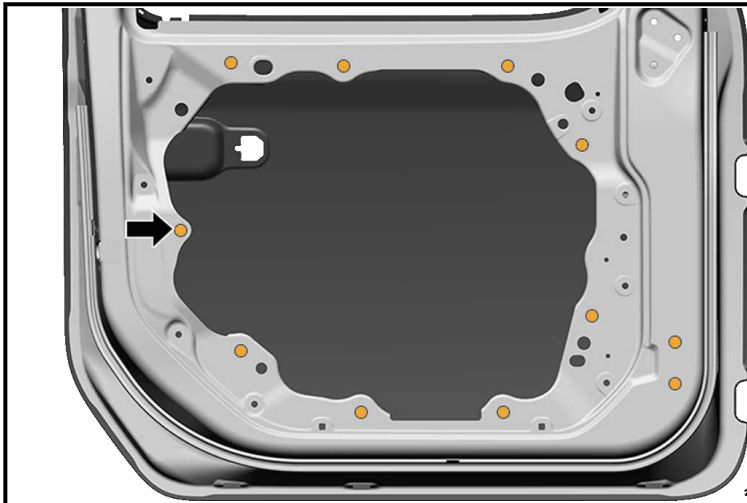


9. If equipped, connect the wire harness connectors (1) and seat the cover plate (2) back into the cargo box sill and seat fully.
10. Connect the negative battery cable(s). Refer to the appropriate service information .

DOORS - FRONT

STANDARD PROCEDURE

STANDARD PROCEDURE - CLINCH NUT REPAIR



Cross-Threaded Clinch Nut

1. Drill out threads by drilling 6.3 mm (0.25 in.) hole through clinch nut.
2. Tap length of hole for an M6 - 1.0 thread.
3. Install 06101025 (M6 Heli-Coil) so that the Heli-Coil is at or just below surface of clinch nut.
4. Break off tang at end of Heli-Coil.

Missing Clinch Nut

Option 1 - Coupon And Clinch Nut

1. Obtain 1.0 mm (0.04 in.) thick aluminum (MS.50005-AA6000-HF P1 U) coupon (25 mm x 25 mm) (1.0 in. x 1.0 in.).

2. Place coupon over hole area to verify there is enough space to weld coupon onto inner panel.
3. Drill a 10 mm (0.4 in.) hole in center of coupon for installation of clinch nut.
4. Align hole of coupon with hole of inner panel where the clinch nut is missing. TIG weld coupon over hole location.
5. Install 06511973AA (M6 clinch nut) using the clinch nut installation tool.
6. Paint the surrounding areas for corrosion protection as per PSOP 8500.

Option 2 - New Clinch Nut

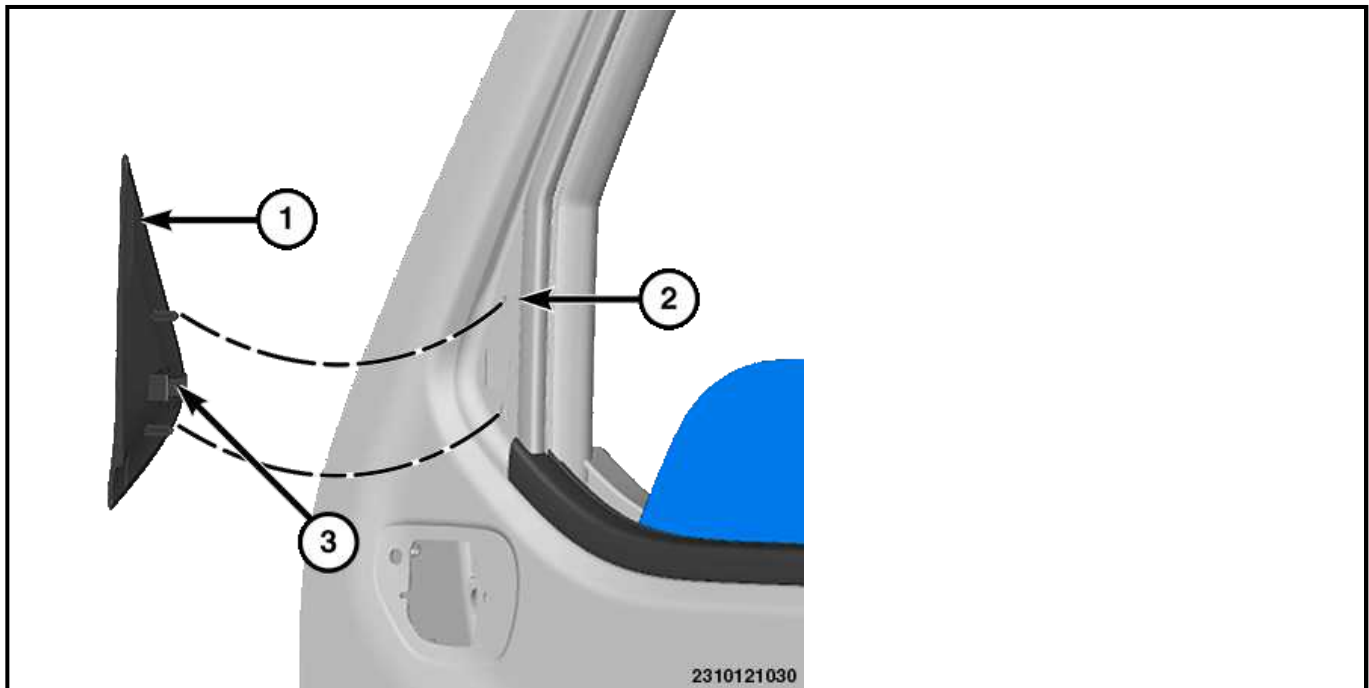
1. Dip clinch nut in zinc-rich primer (PPG 1808 or MS-PB7-5) and install wet clinch nut 06511973AA using clinch nut installation tool.

CHANNEL, DOOR GLASS

REMOVAL AND INSTALLATION

DOOR GLASS CHANNEL

REMOVAL

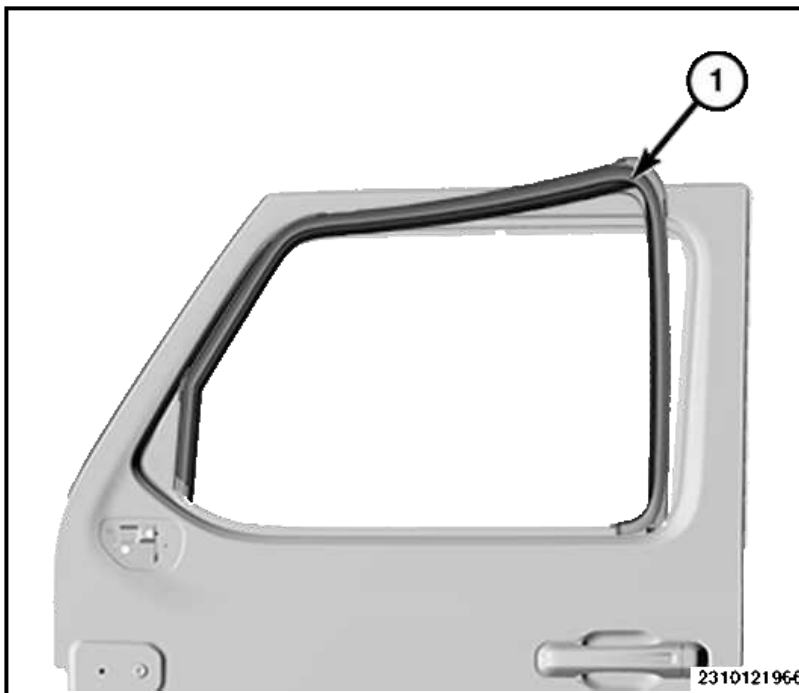


1 - Trim

2 - Door Frame

3 - Clip

1. Lower the door glass to the lowest position.
2. Using a trim stick or equivalent, separate the clip and remove the trim from the door frame.
3. Remove the outer belt molding. Refer to **MOLDING, OUTER BELT, REMOVAL AND INSTALLATION**.



1 - Door Glass Channel

4. Starting at the rear of the door, separate the door glass channel from the door. Lift up at the front to remove from the front glass run.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Using soapy water, slide the front of the door glass channel down into the front glass run.
- Starting at the front of the door, install the door glass channel to the door.
- Verify the trim clips are fully seated.

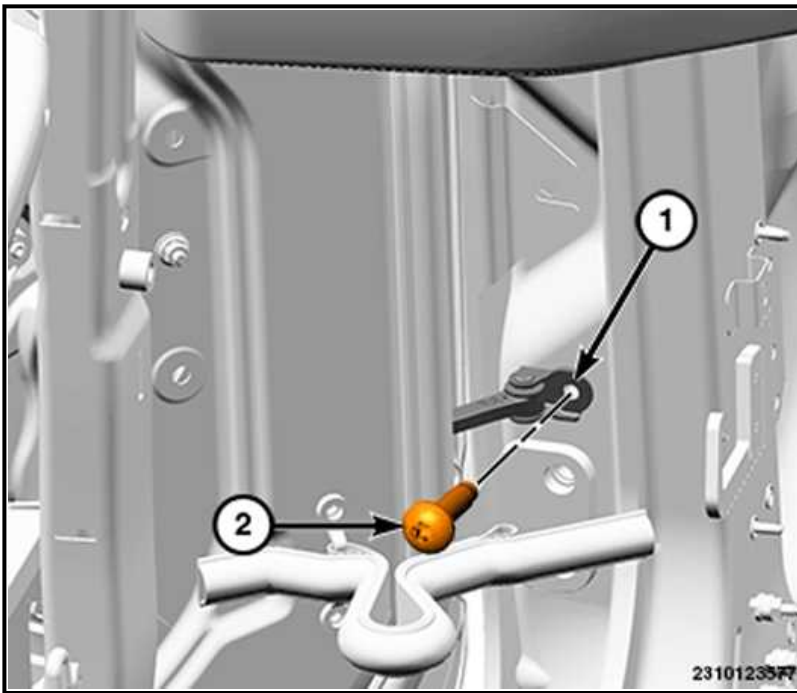
CHECK, DOOR

REMOVAL AND INSTALLATION

DOOR CHECK

REMOVAL

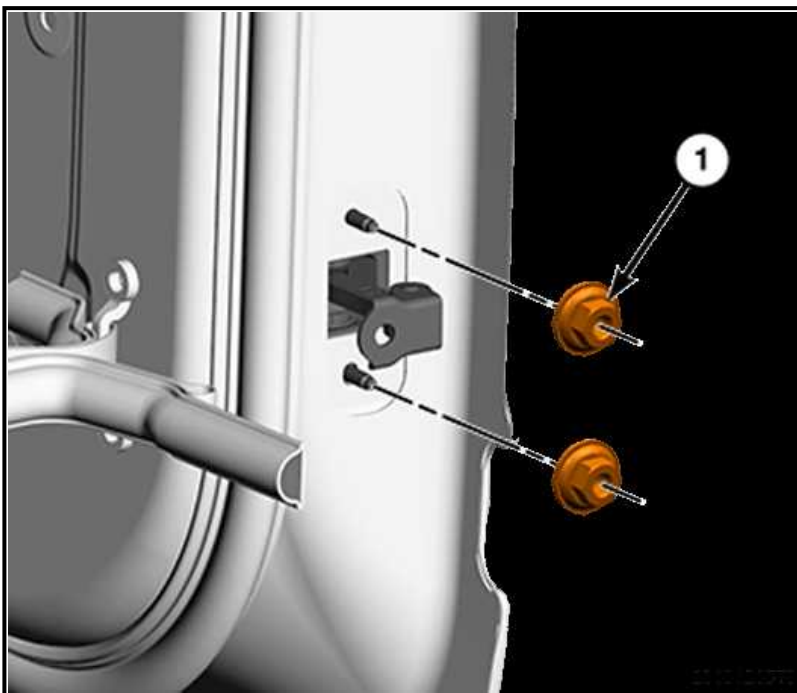
1. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



1 - Check Arm

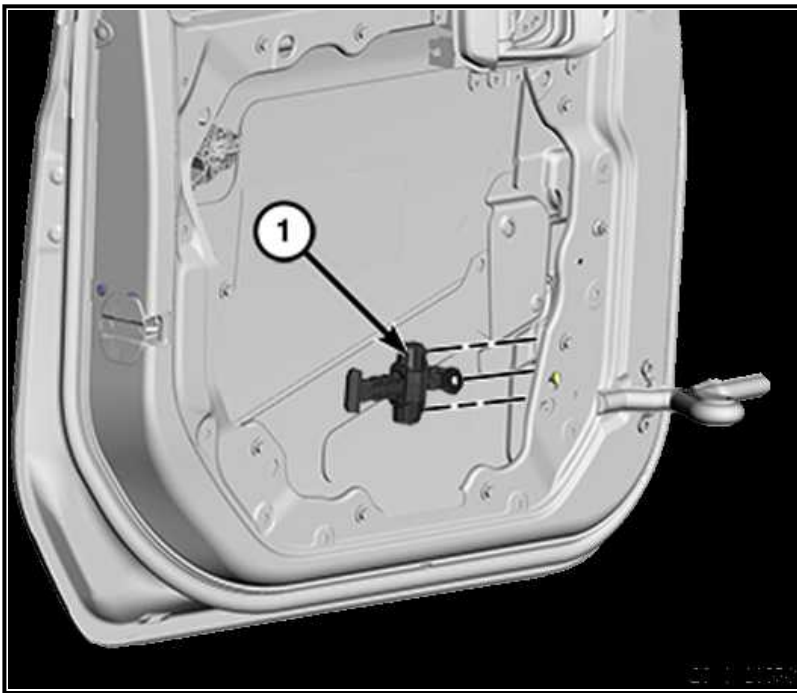
2 - Check Arm Bolt

2. Open the door and remove the check arm bolt connecting the check arm to the A-pillar.



1 - Check Strap Nut

3. Remove the nuts securing the check strap to the door.



1 - Check Strap

4. Remove the check strap from the door opening.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

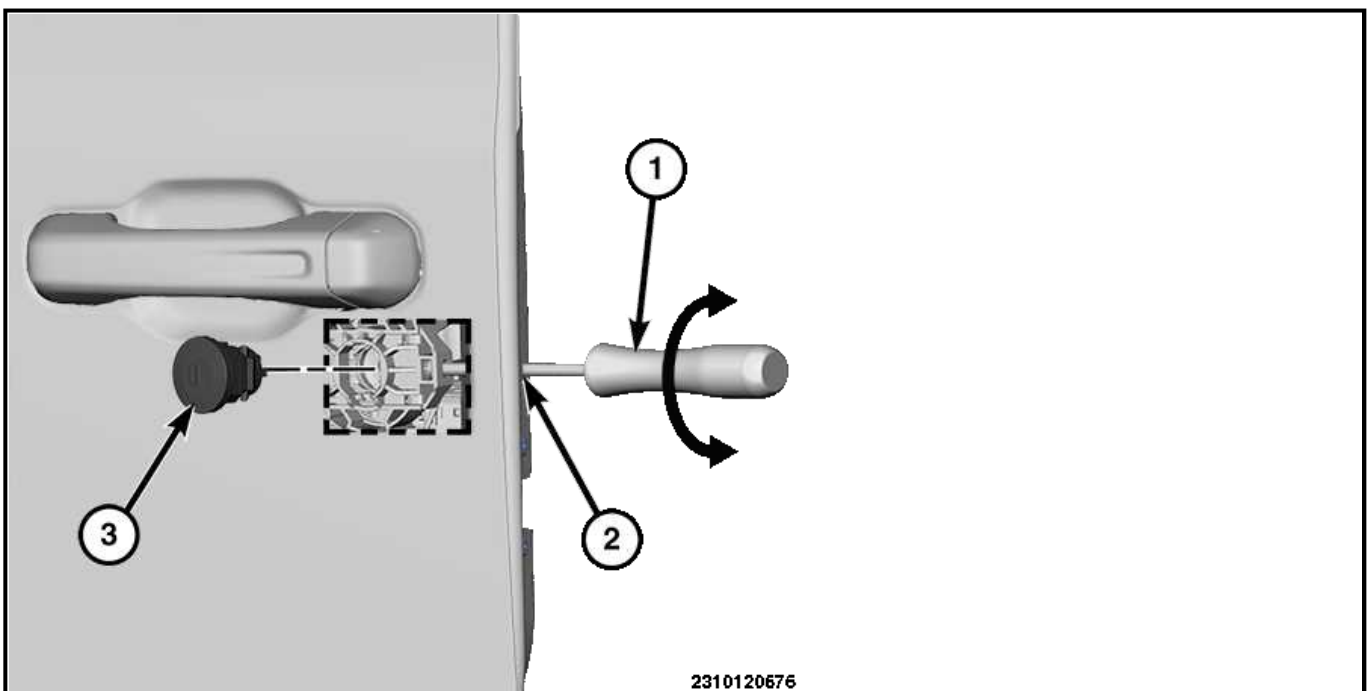
- Install the nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the bolt to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

CYLINDER, DOOR LOCK

REMOVAL AND INSTALLATION

DOOR LOCK CYLINDER

REMOVAL



1 -Tool
2 - Plate Screw
3 - Lock Cylinder

1. Remove the protective tape used to cover the slide plate screw located rearward of the door lock cylinder.
2. Using a suitable tool turn the screw counter-clockwise to move the slide plate forward in the support bracket. **Do not attempt to remove the slide plate screw.**
3. Continue to turn the screw while lightly pulling on the lock cylinder, until the cylinder is removed.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Once properly positioned and while pushing the door lock cylinder against the door, turn the slide plate screw accessible rearward of the lock cylinder and tighten securely.

DOOR

REMOVAL AND INSTALLATION

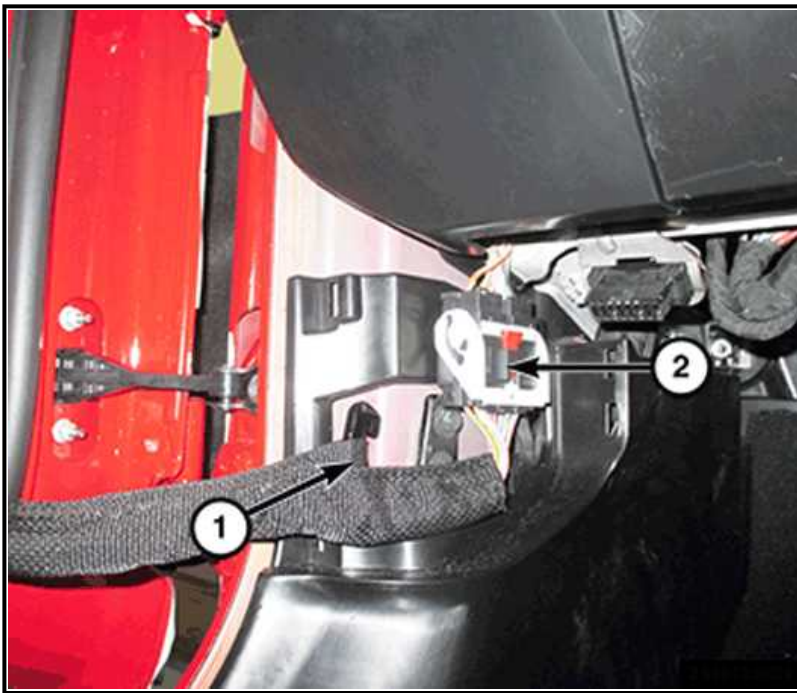
DOOR

REMOVAL



1 - Wiring Cover

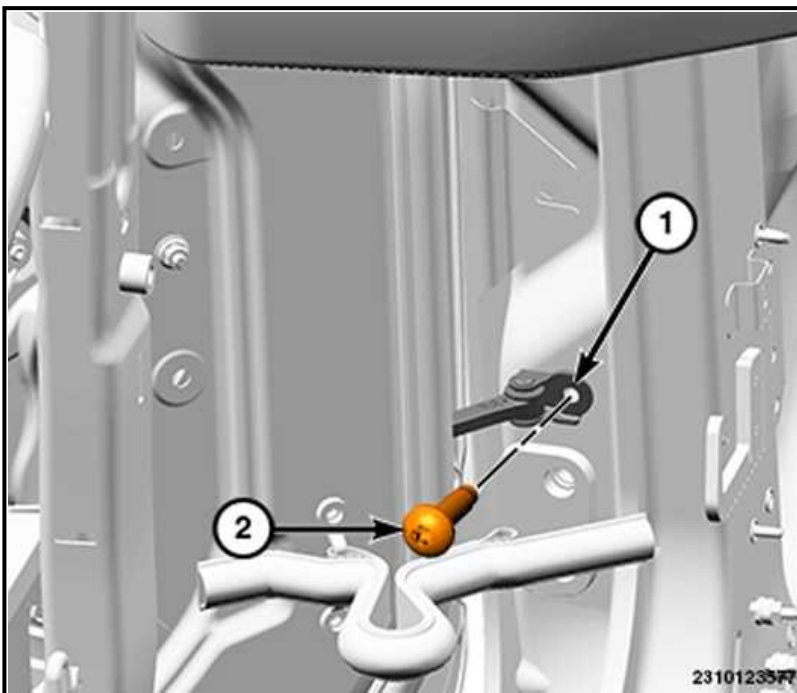
1. Using a trim stick, release and remove the wiring cover.



1 - Support Bracket

2 - Wire Harness Connector

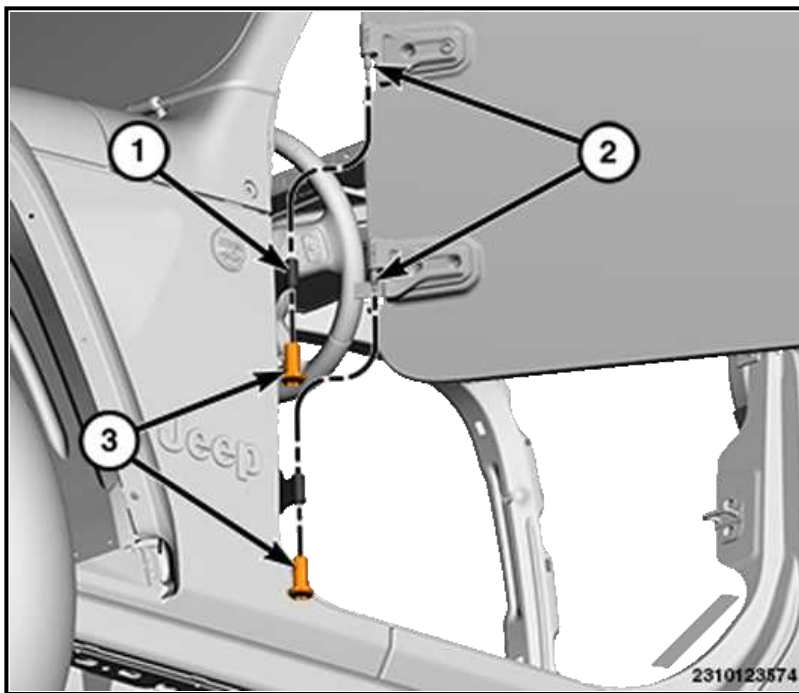
2. Disconnect the wire harness connector and release the wire harness from the support bracket.



1 - Door Check

2 - Door Check Bolt

3. Remove the door check bolt securing the door check.



1 - Hinges
2 - Pins
3 - Door Nuts

4. Remove the door nuts and lift the door up off hinges and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Align pins on door hinges to holes in hinges on body and position door into place.
- Install the nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the door check bolt and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- If necessary, adjust the door. Refer to [GAP AND FLUSH, SPECIFICATIONS](#).
- Verify the wiring cover is fully seated.

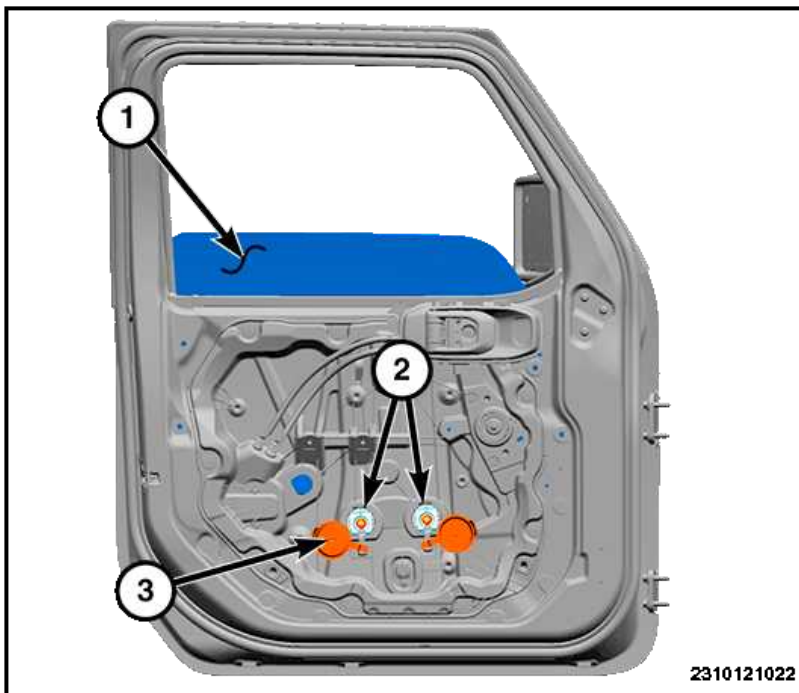
GLASS, DOOR

REMOVAL AND INSTALLATION

DOOR GLASS

REMOVAL

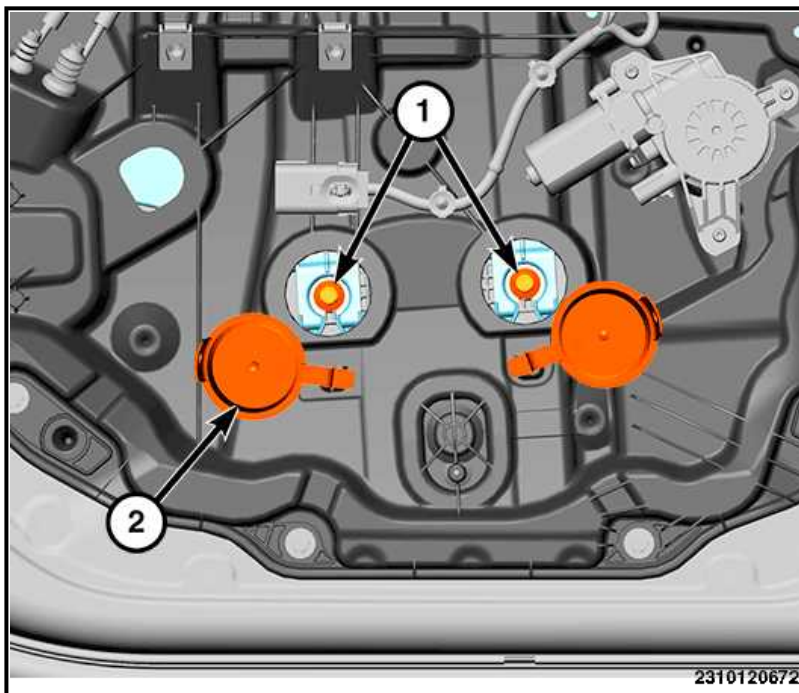
1. Remove the front door trim panel. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#).



1 - Window
2 - Access Holes
3 - Access Hole Plugs

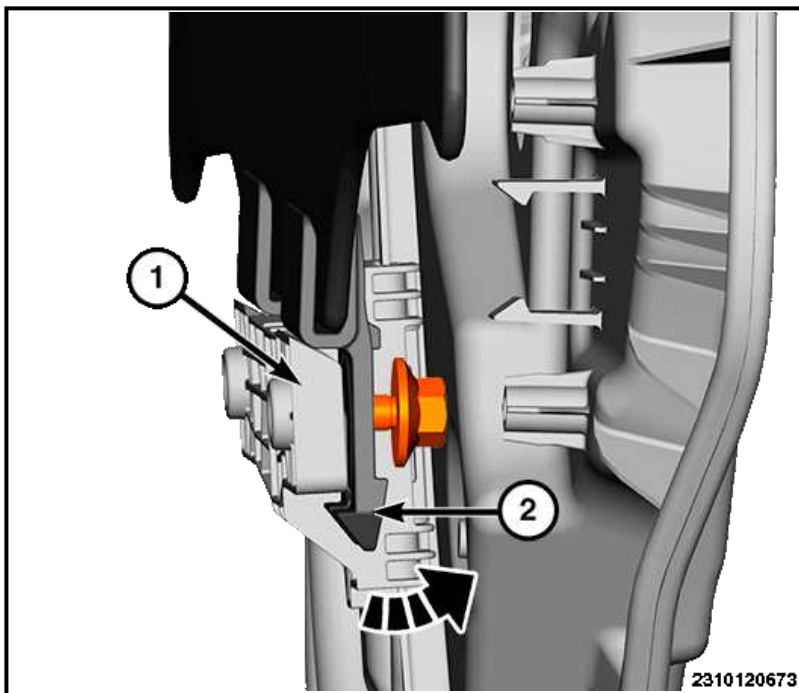
NOTE: Left side shown in illustration, right side similar.

2. Remove the inner belt weatherstrip from the front door.
3. Open the access hole plugs and position aside.
4. Remove the window motor and lower the window until the glass fasteners are visible in both access holes. Refer to [MOTOR, WINDOW REGULATOR, REMOVAL AND INSTALLATION](#).



1 - Glass Fasteners

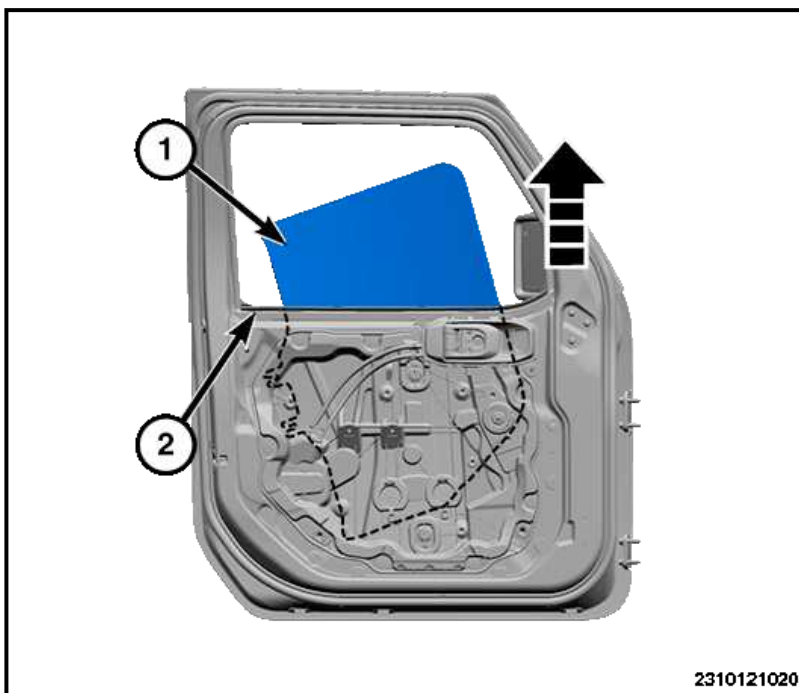
5. Loosen the glass fasteners



1 - Regulator Lift Plate

2 - Lower Glass Tabs

6. Using a hook-type tool or equivalent, release the lower glass tabs from the regulator lift plates.



1 - Door Glass

2 - Window Opening

WARNING: Use care when removing the door glass to prevent breakage. Do not force the glass out of the door. Failure to follow this warning may result in serious injury.

7. Carefully rotate the door glass within the window opening and remove the glass from the door through the window opening.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- From the outside of the front door, insert the front side of the glass into the top of the door shell first to load the glass into the door.
- Rotate the door glass into position and secure it to the window regulator glass sliders making sure the glass and lift plates are properly seated.
- Tighten the glass fasteners to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

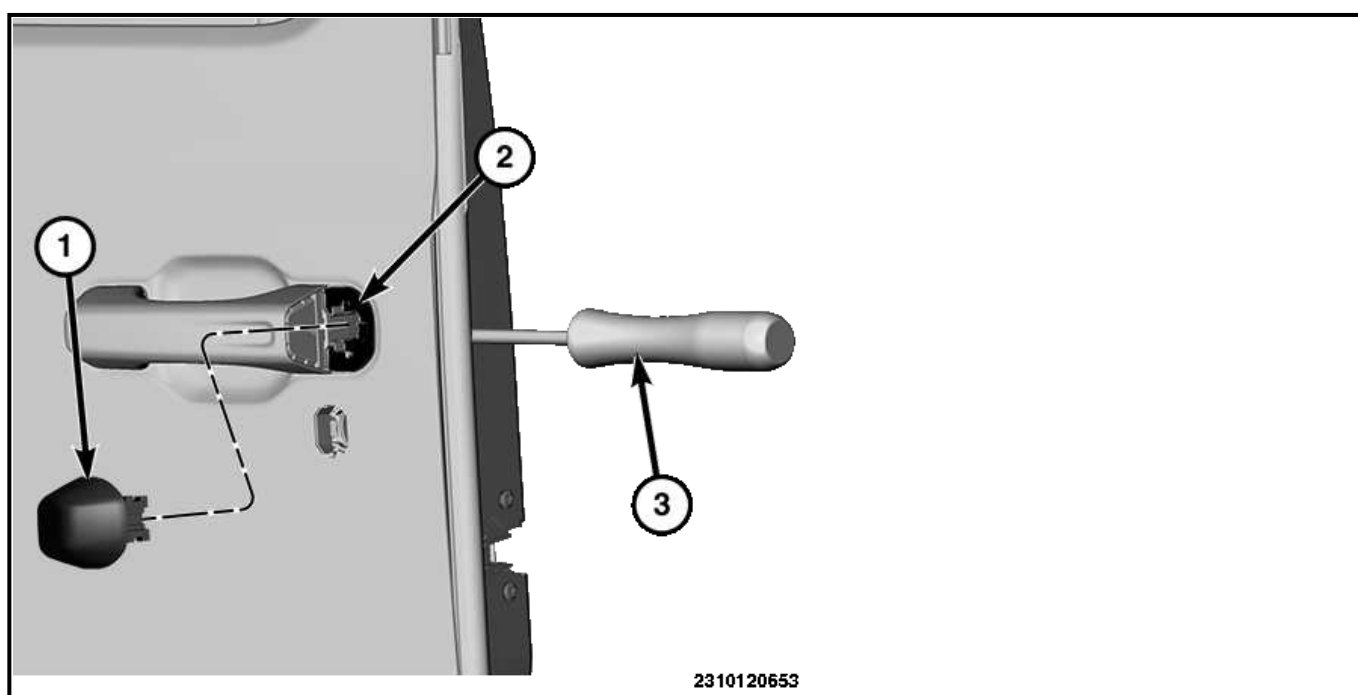
HANDLE, EXTERIOR

REMOVAL AND INSTALLATION

EXTERIOR HANDLE

REMOVAL

NOTE: Left side shown in illustration, right side similar.

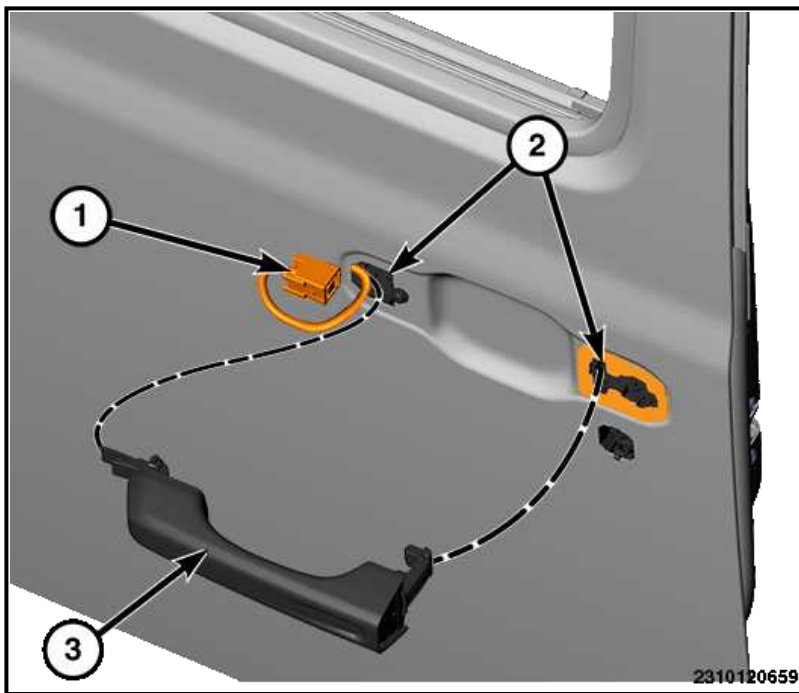


1 - Door Handle Cap

2 - Door Handle Gasket

3 - Tool

1. Remove the protective tape used to cover the slide plate screw located rearward of the door handle cap.
2. Using a suitable tool, turn the screw counter-clockwise to move the slide plate forward in the outside door handle bracket. **Do not attempt to remove the slide plate screw.**
3. Continue to turn the screw while lightly pulling on the door handle cap until the cap is removed.



1 - Wire Harness Connector
2 - Door
3 - Door Handle

4. Slide handle rearward and out.

5. Disconnect the wire harness connector and remove the handle.

NOTE: Left side shown in illustration, right side similar.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Slide the handle in and forward.
- Once properly positioned and while pushing the handle cap against the handle gasket, tighten the screw accessible rearward of the handle to the proper and install the protective tape over the fastener opening. Refer to [TORQUE SPECIFICATIONS](#).

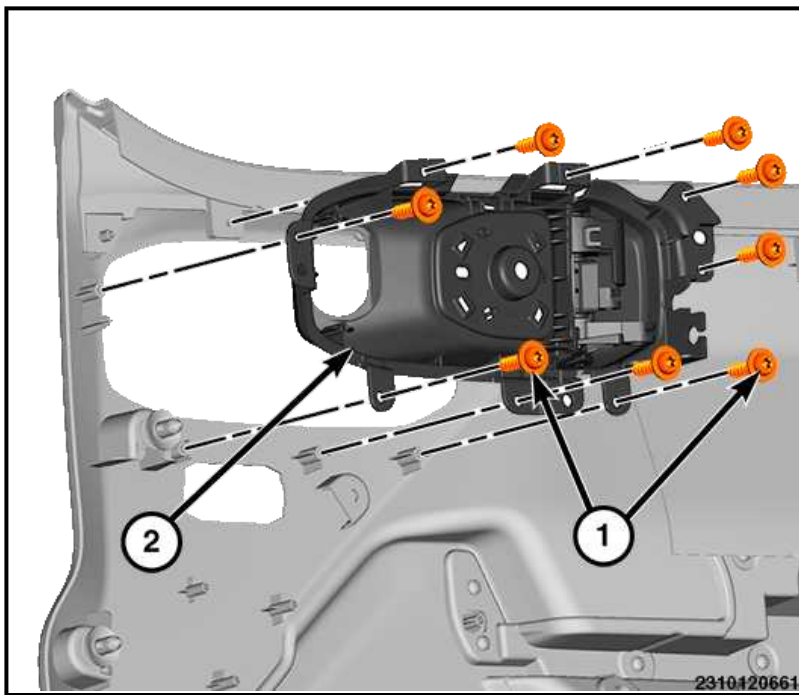
HANDLE, INTERIOR

REMOVAL AND INSTALLATION

INTERIOR HANDLE

REMOVAL

1. Remove the front door trim panel. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#).



1 -Bezel Screws
2 - Interior Handle

2. Disconnect the wire harness connectors as necessary.
3. Remove the bezel screws.
4. Remove the interior handle from the door trim panel.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

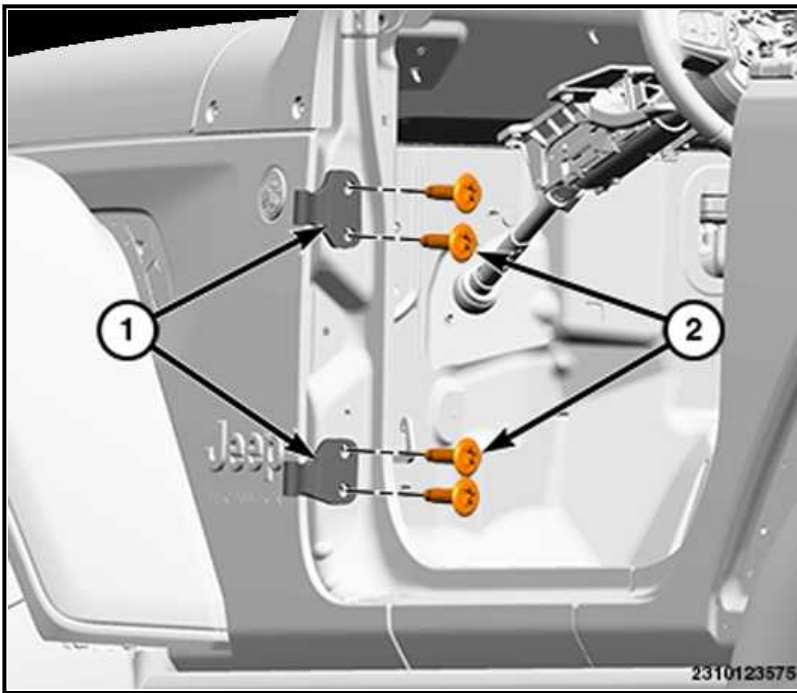
HINGE, DOOR

REMOVAL AND INSTALLATION

DOOR HINGE

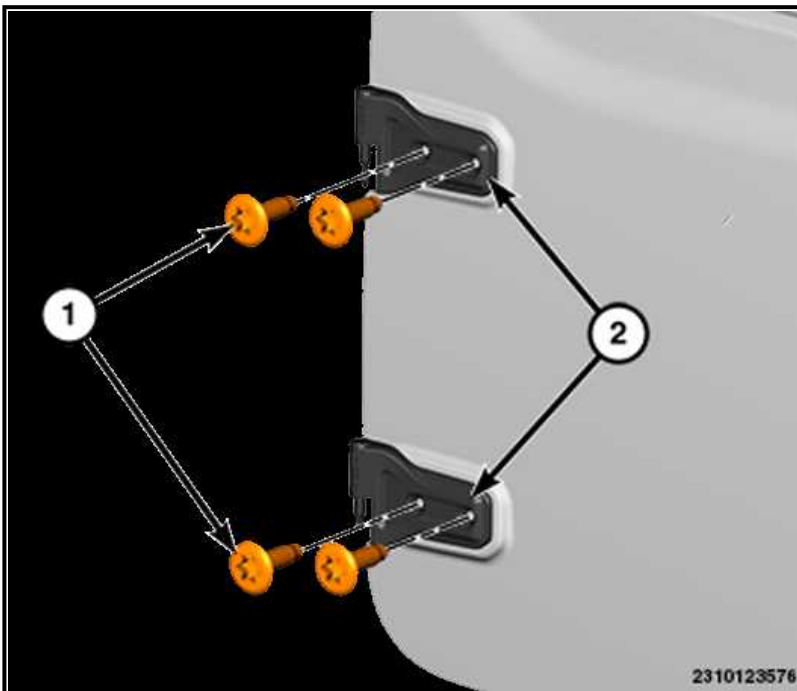
REMOVAL

1. Remove the door. Refer to [DOOR, REMOVAL AND INSTALLATION](#).



1 - Body Side Hinge
2 - Door Hinge Body Bolts

2. Using a grease pencil or equivalent, mark the position of the door hinge on the door and on the body to aid installation.
3. Remove the door hinge to body bolts and remove the body side hinge.



1 - Door Hinge Bolts
2 - Door Side Hinge

4. Remove the door hinge to door bolts and remove the door side hinge.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- A suitable body sealant should be used when removing or moving the hinges.
- Position the door hinge and loosely install the door side bolts.
- Align the door hinge to the reference marks made previously and tighten door side bolts.
- Tighten the door side bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Position the body side door hinge and loosely install the body side bolts.
- Align the door hinge to the reference marks made previously and tighten the door hinge bolts.
- Tighten body side bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- If necessary, adjust the door. Refer to [GAP AND FLUSH, SPECIFICATIONS](#).

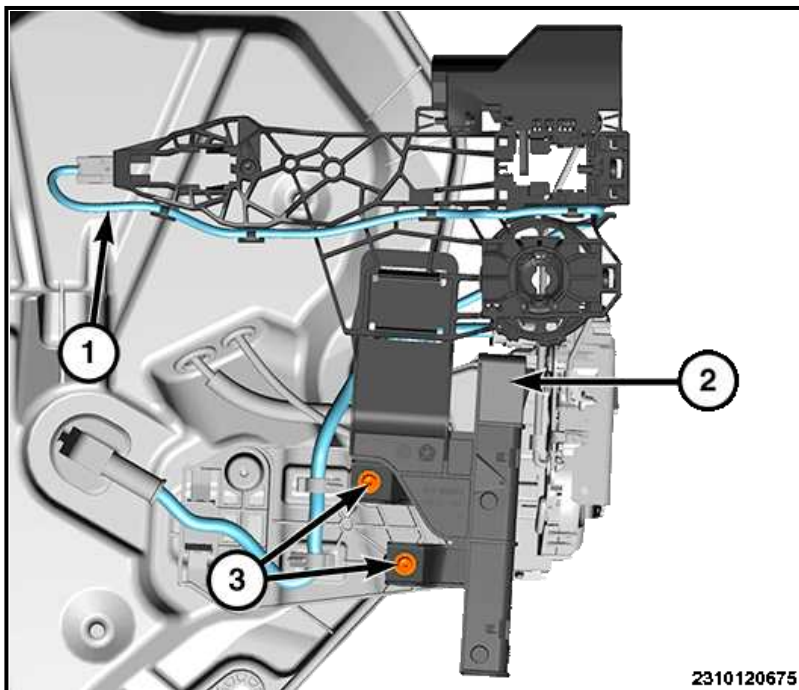
LATCH, DOOR

REMOVAL AND INSTALLATION

DOOR LATCH

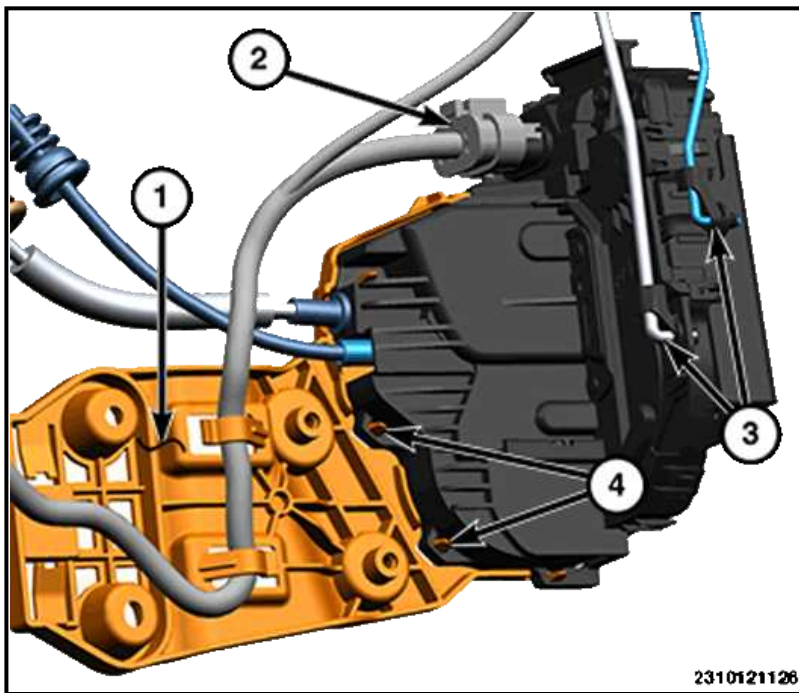
REMOVAL

1. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



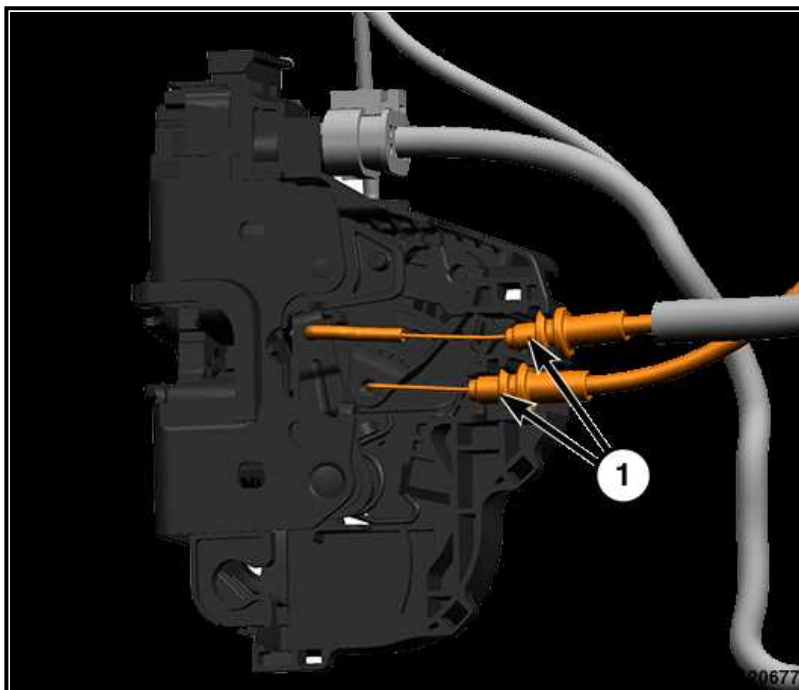
1 - Wire Harness
2 - Glass Run Channel
3 - Screws

2. Remove the screws for the glass run channel.
3. Separate the wire harness from glass run and handle support.



1 - Latch Presenter
2 - Wire Harness Connector
3 - Control Rod
4 - Latch Cover Tabs

4. Disconnect the control rods.
5. Disconnect the wire harness connector.
6. Release the latch cover tabs and remove the latch presenter.



1 - Lock Cables

7. Disconnect handle and lock cables and remove the latch assembly.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

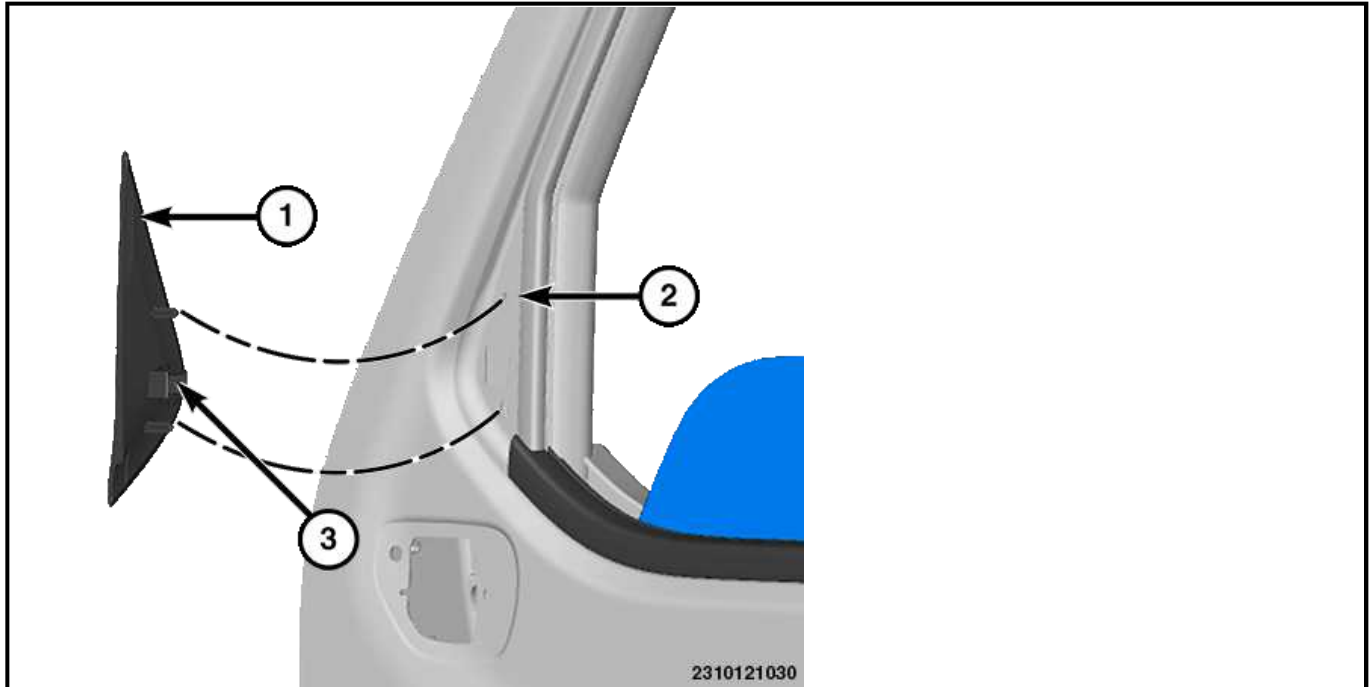
- All fasteners are tightened securely.

MOLDING, OUTER BELT

REMOVAL AND INSTALLATION

OUTER BELT MOLDING

REMOVAL

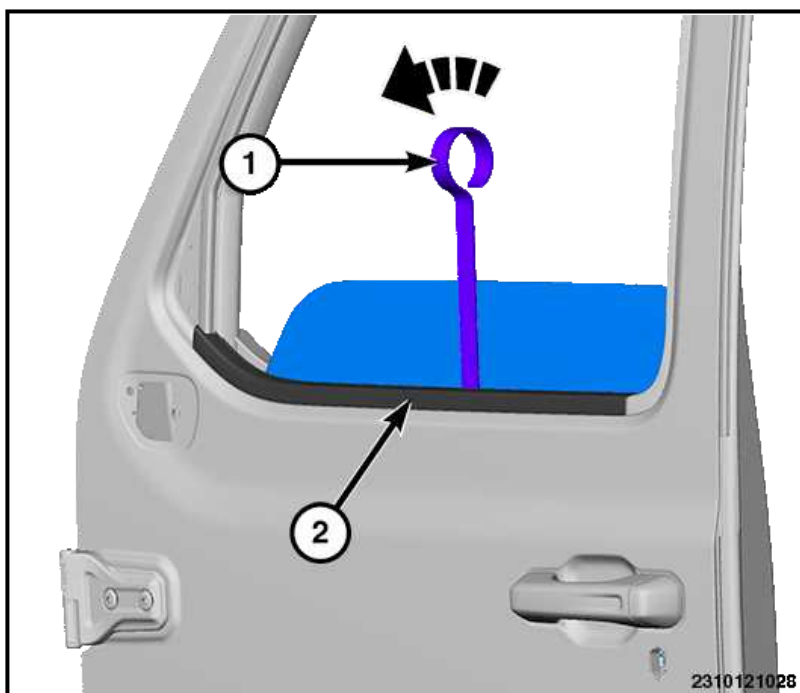


1 - Flag Trim

2 - Door

3 - Clips

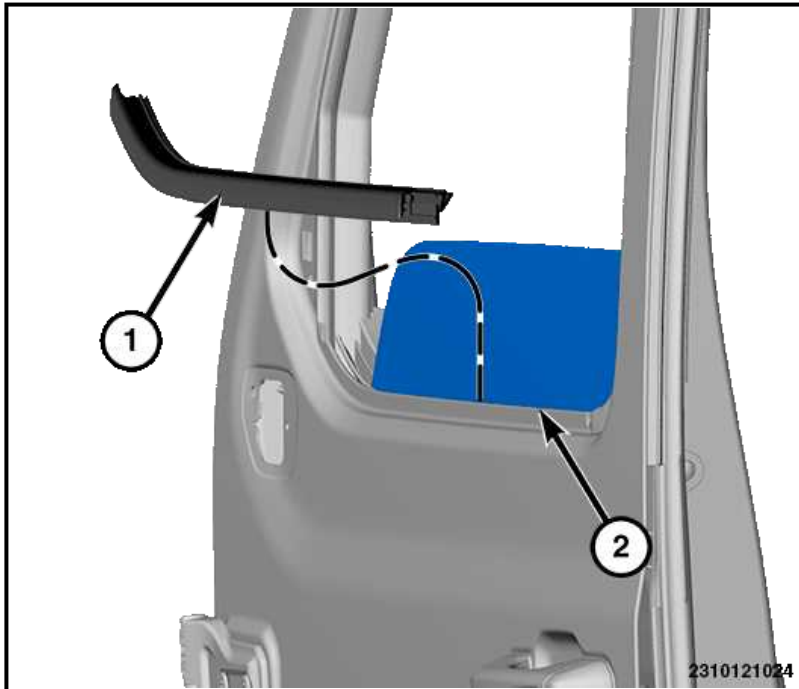
1. Using a trim stick or equivalent, separate the clips and remove the flag trim from the door.



1 - Belt Molding Remover Tool

2 - Outer Belt Molding

2. Lower the door glass fully.
3. Using special tool (special tool #9093, Remover, Belt Moldings) between belt molding and glass, push down on outer belt molding and rotate upper part of tool outward from vehicle approximately 6-8 cm (2.5-3.0 in.) then lift up on molding to disengage from locking tabs.



1 - Belt Molding

2 - Glass Opening Flange

4. Remove the belt molding from the glass opening flange.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

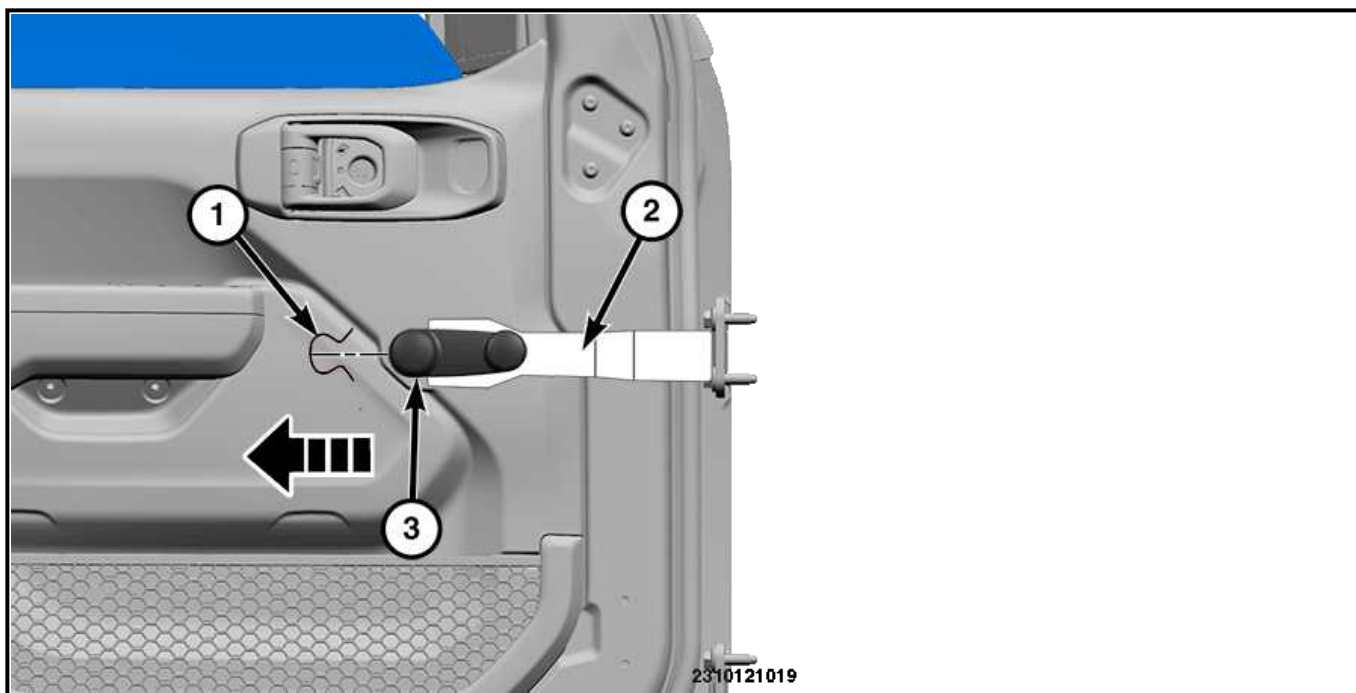
- Verify all clips are fully secured.

PANEL, DOOR TRIM

REMOVAL AND INSTALLATION

DOOR TRIM PANEL

REMOVAL

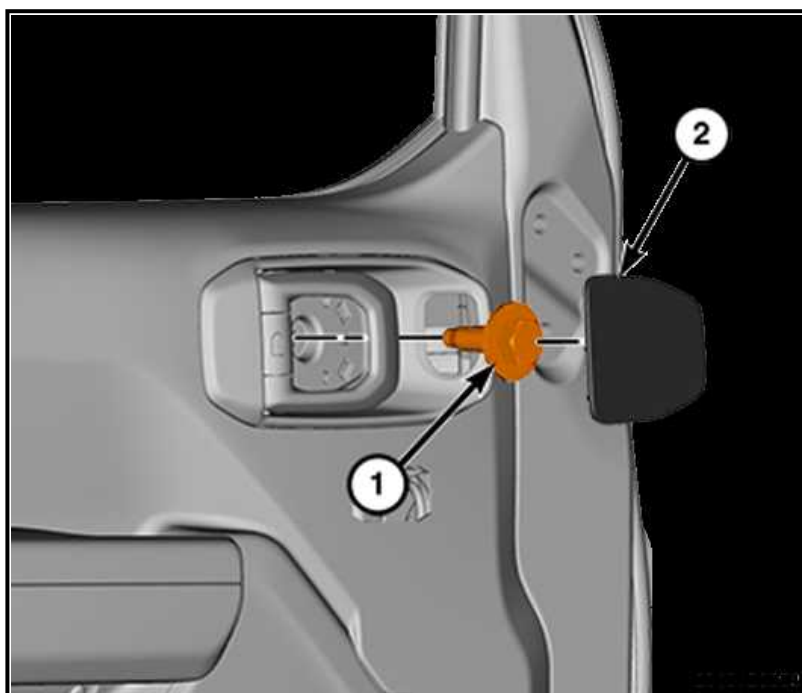


1 - Handle Clip

2 - Window Handle Tool

3 - Handle

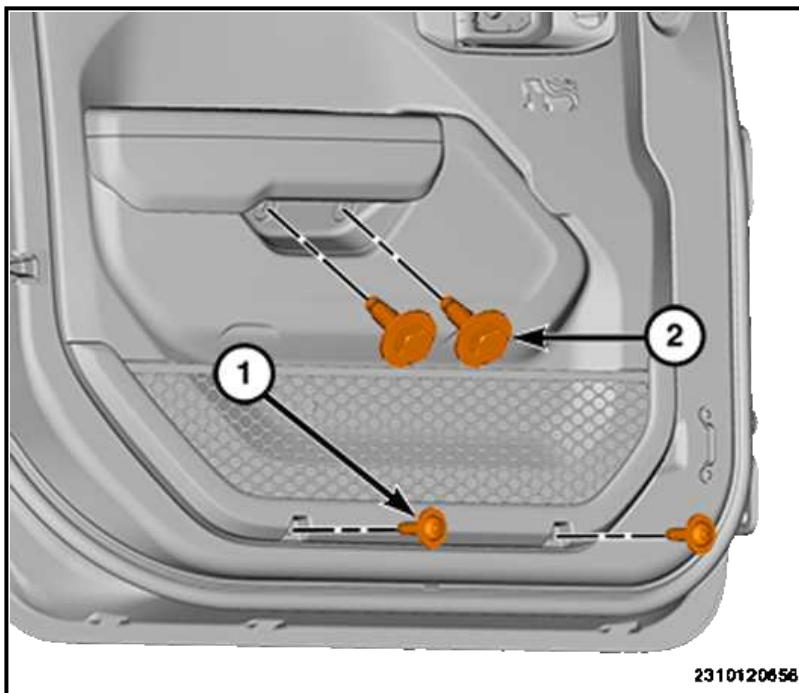
1. Using a standard window handle tool, release the handle clips and remove the handle from the window lift mechanism, if equipped with a manual regulator.



1 - Door Interior Handle Bolt

2 - Trim Cover

2. Using a small pick type tool or equivalent at the slot, remove the trim cover.
3. Remove the door interior handle bolt.

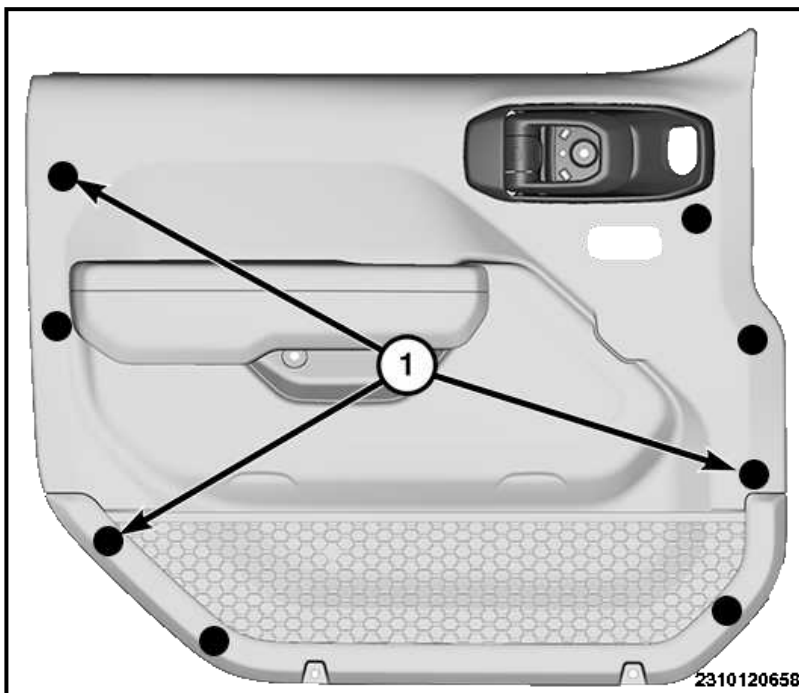


1 - Lower Screw

2 - Armrest Bolt

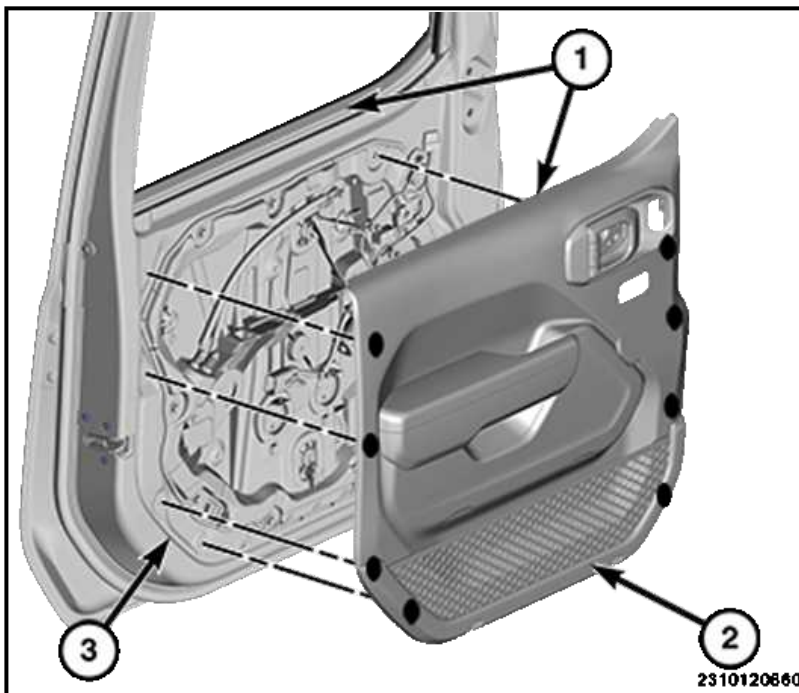
4. Remove the lower screws.

5. Remove the armrest bolts.



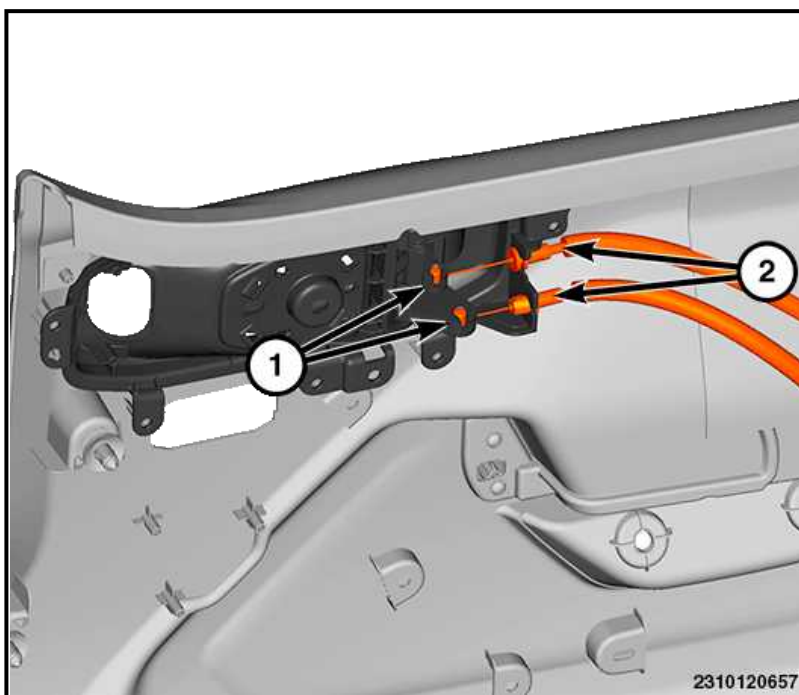
1 - Push Pin Fasteners

6. Using special tool (special tool #C-4829A, Remover, Trim), separate the push pin fasteners.



1 - Door
2 - Trim Panel Assembly
3 - Inner Door

7. Separate the trim panel assembly from the door.



1 - Cable Barrel Ends
2 - Interior Handle Cables

8. Disconnect the wire harness connectors as necessary.

9. Disconnect the interior handle cables and remove the barrel end from the interior handle.

NOTE: Prior to installing the door trim panel, replace any trim panel retaining clips that may have been damaged during the removal process.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the armrest bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the door interior handle bolt under handle trim cover and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

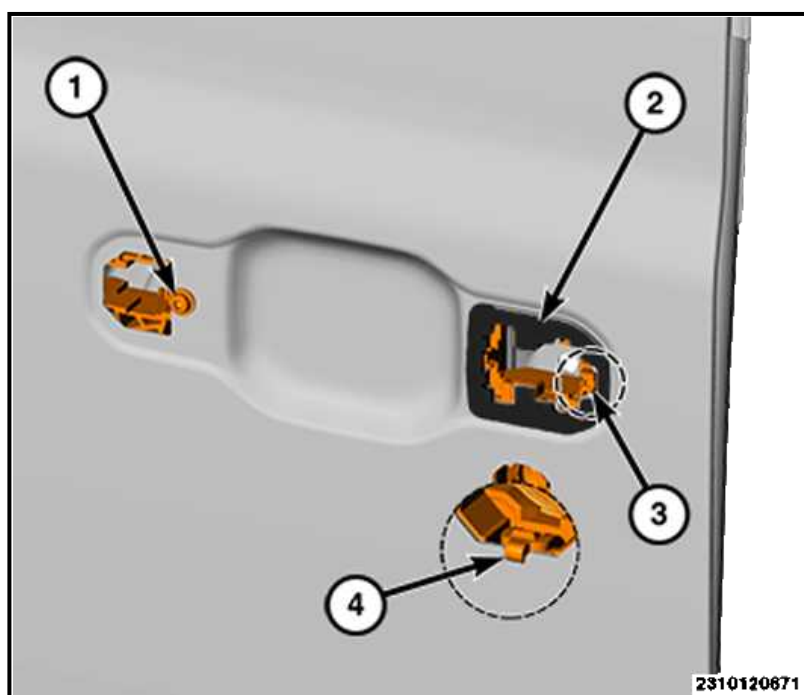
PLATE, CARRIER

REMOVAL AND INSTALLATION

CARRIER PLATE

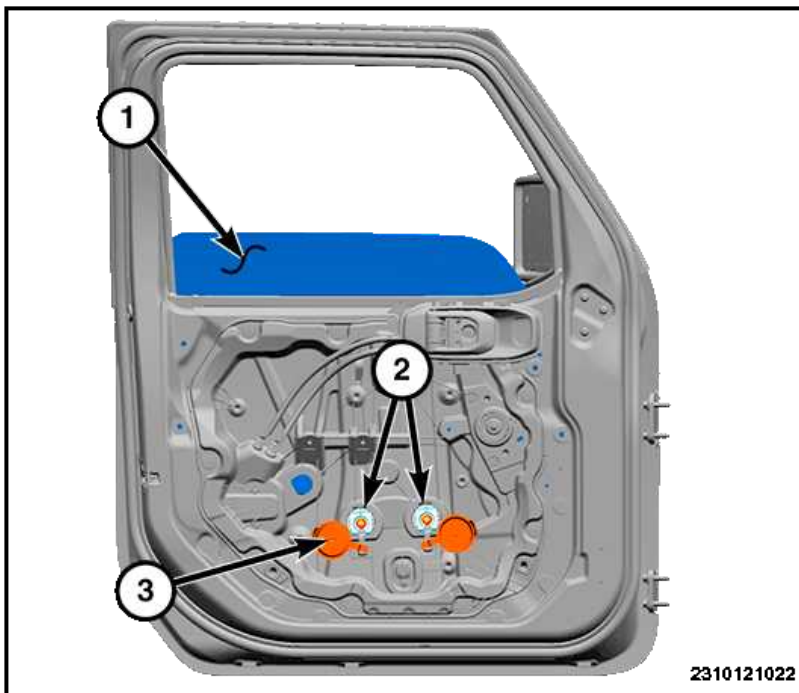
REMOVAL

1. Remove the exterior handle. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) [HANDLE, INTERIOR, REMOVAL AND INSTALLATION](#).
2. Remove the lock cylinder, if equipped. Refer to [CYLINDER, DOOR LOCK, REMOVAL AND INSTALLATION](#).



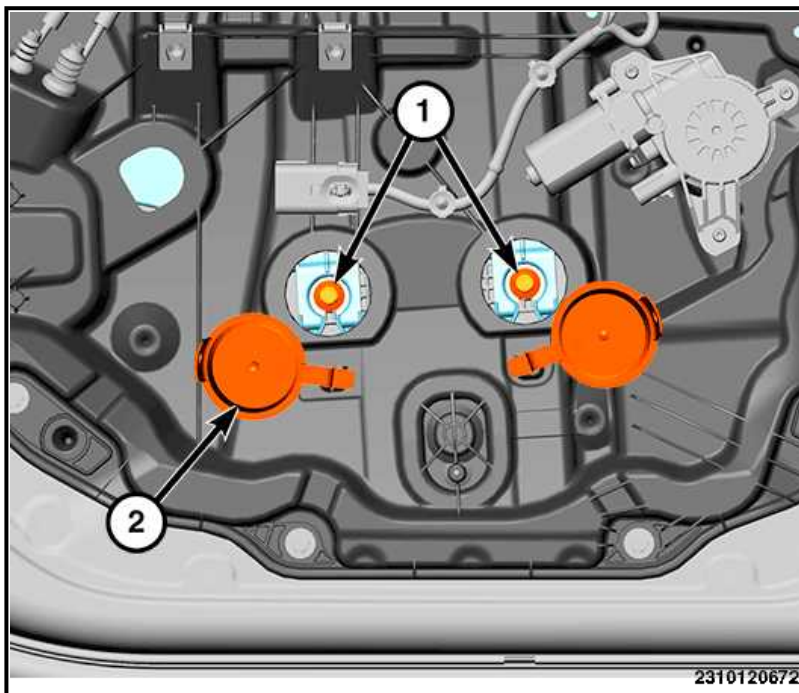
1 - Exterior Handle Support Screw
2 - Handle Gasket
3 - Bracket Hook
4 - 2nd Hook

3. Remove the handle gasket.
4. Loosen the exterior handle support screw but do not remove it.
5. Release the bracket hook from the outer panel and slide the handle bracket forward.
6. Remove the front door trim panel. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#).



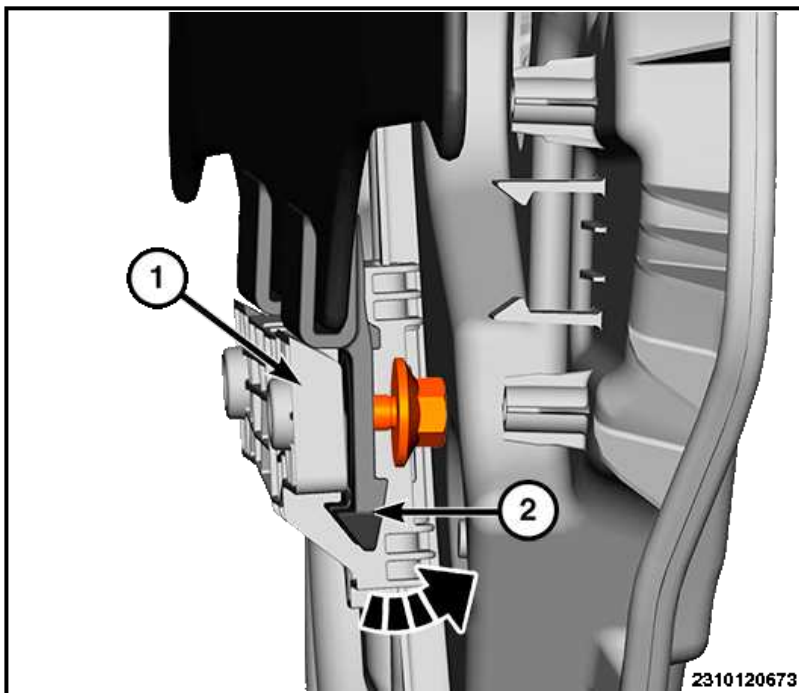
1 - Window
2 - Access Holes
3 - Access Plug

7. Open the access plugs and position aside.
8. Remove the window motor and lower the window until the glass fasteners are visible in both access holes. Refer to [MOTOR, WINDOW REGULATOR, REMOVAL AND INSTALLATION](#).



1 - Fasteners
2 - Access Plug

9. Loosen the glass fasteners.

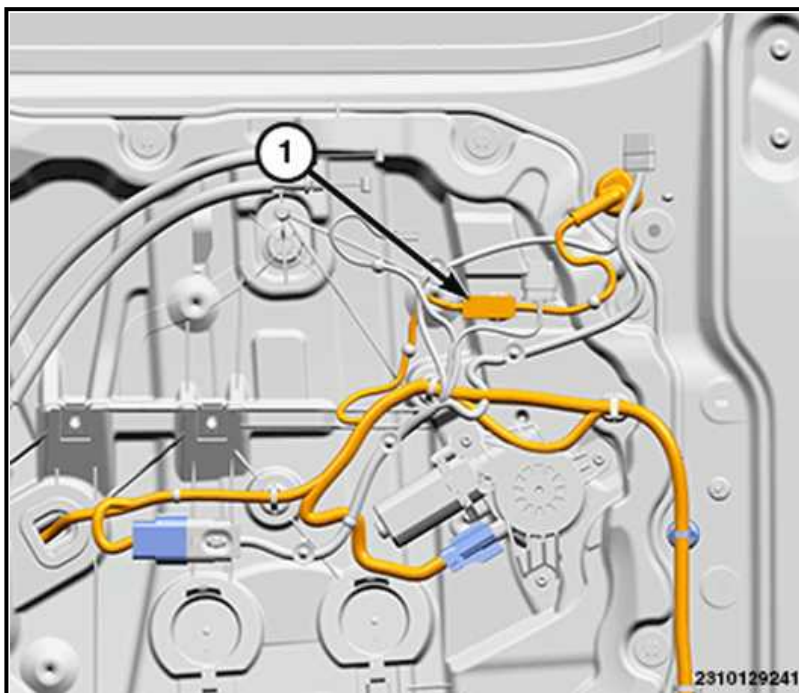


1 - Regulator Lift Plate

2 - Lower Glass Tabs

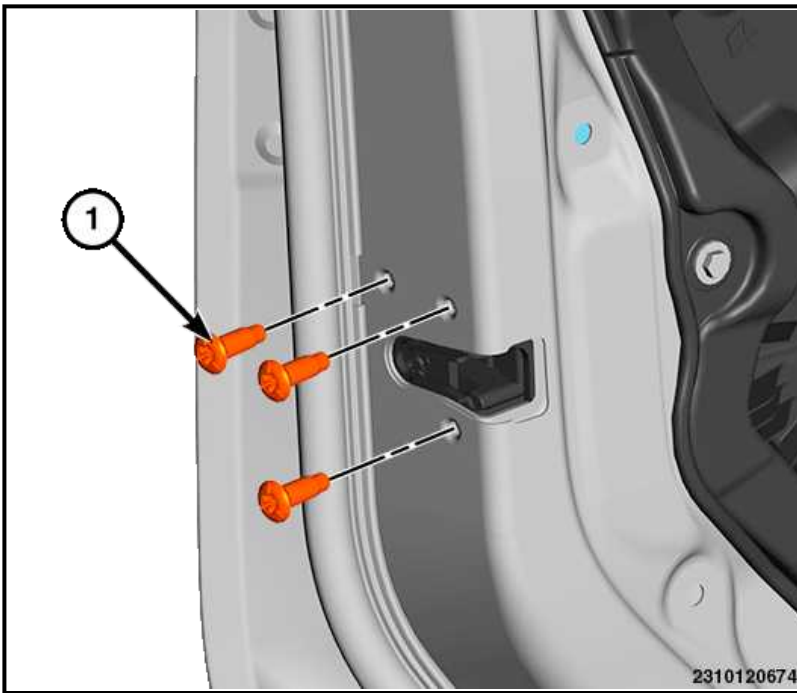
10. Using a hook-type tool or equivalent, release the lower glass tabs from the regulator lift plates.

11. Secure the window glass into place with a wedge or tape.



1 - Power Mirror Wire Harness

12. Disconnect the power mirror wire harness connector.



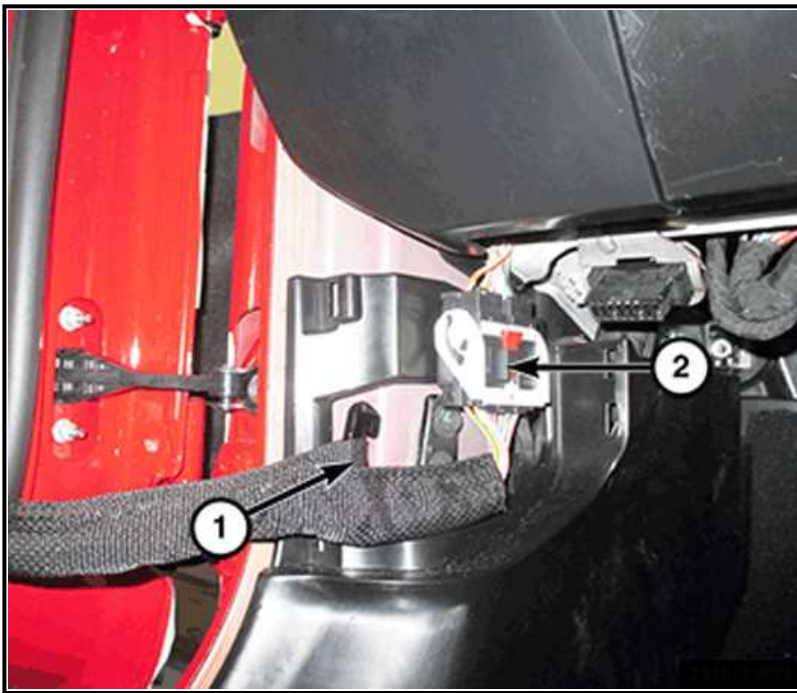
1 -Front Door Latch Mounting Screws

13. Remove the front door latch mounting screws.



1 - Wire Cover

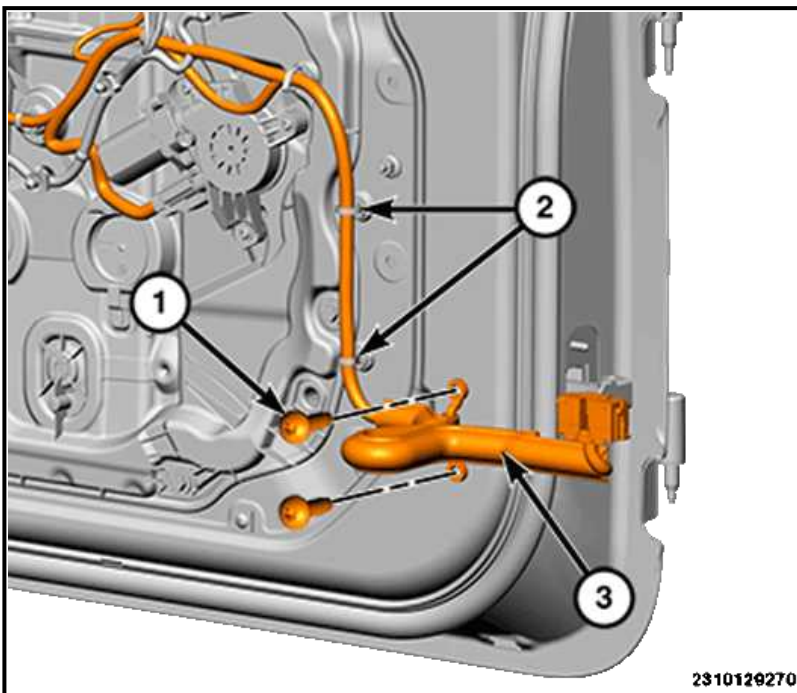
14. Using a trim stick, release and remove the wiring cover.



1 - Support Bracket

2 - Wire Harness Connector

15. Disconnect the wire harness connector and release the wire harness from the support bracket.



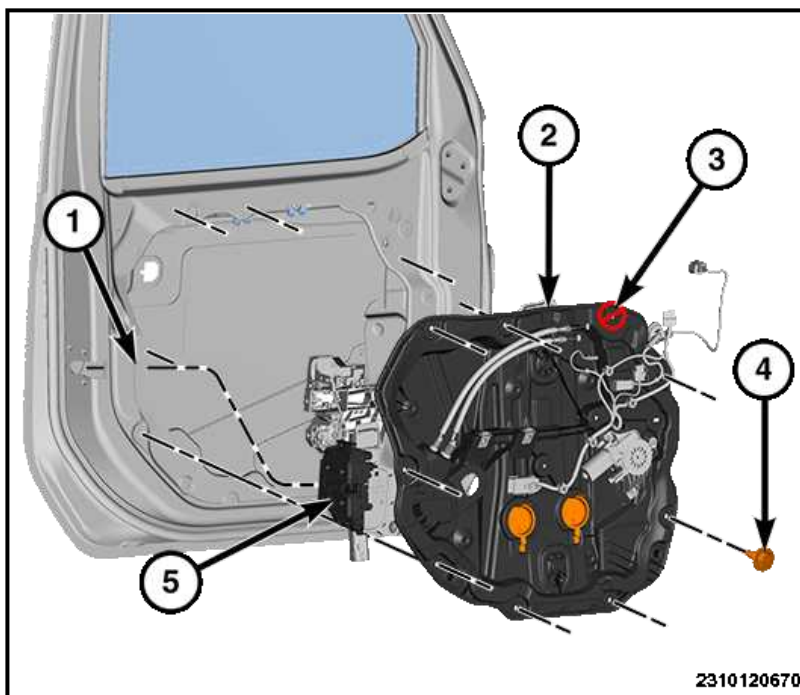
1 - Screw

2 - Support Clips

3 - Front Door Wire Harness

16. Release the harness support clips.

17. Remove the screws from the front door wire harness bracket from the front of the door.

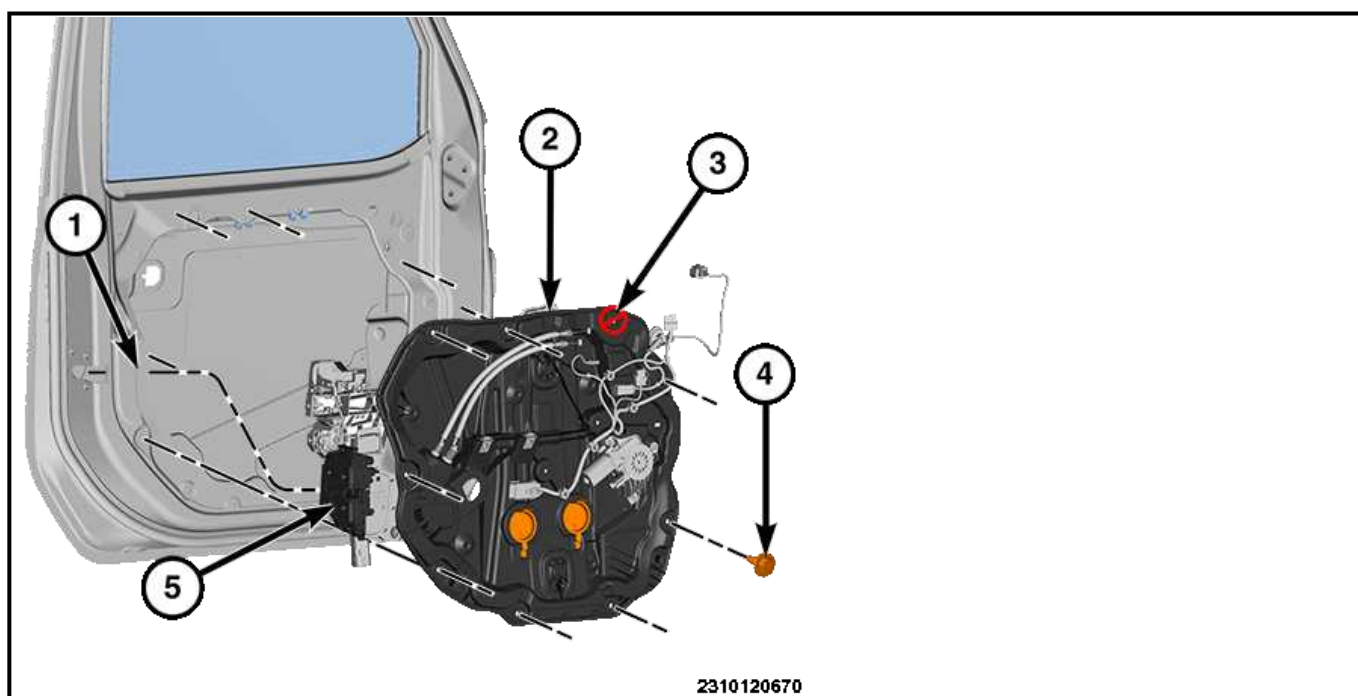


1 - Door Interior
2 - Carrier Plate Assembly
3 - This bolt hole is a locator used during the trim panel removal and installation. (Do Not Add Bolt.)
4 - Carrier Plate Assembly Bolts
5 - Latch Assembly

18. Remove the carrier plate assembly bolts and separate the carrier plate assembly from the door.
19. Move the assembly forward in the door and remove the latch assembly from the door interior and remove the carrier plate.

INSTALLATION

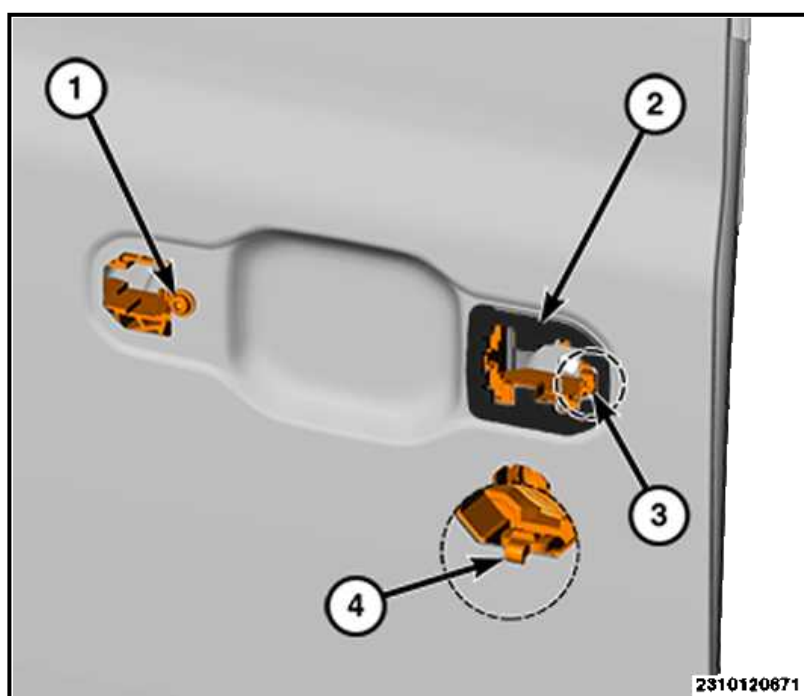
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.



1 - Door Interior

2 - Carrier Plate Assembly
3 - This bolt hole is a locator used during the trim panel removal and installation. (Do Not Add Bolt.)
4 - Carrier Plate Assembly Bolts
5 - Latch Assembly

- Do not add a bolt to hole. This bolt hole is a locator used during the trim panel removal and installation.
- Install the door latch bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Position the door glass and secure it to the window regulator glass sliders, making sure the glass and lift plates are properly seated.
- Tighten the door glass bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



1 - Exterior Handle Support Screw
2 - Handle Gasket
3 - Bracket Hook
4 - 2nd Hook

- Engage the exterior handle support screw into the slot of the outer panel and engage the bracket hook over the edge of the outer panel.
- Engage the 2nd hook onto the outer panel at the key cylinder hole.
- While pushing the bracket hook rearward, tighten the exterior handle support screw to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

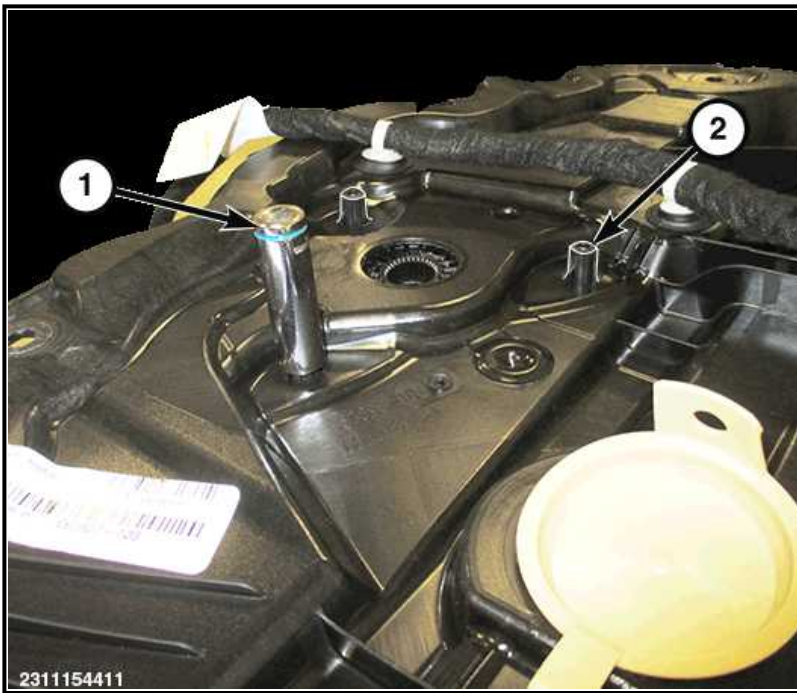
REGULATOR, WINDOW

REMOVAL AND INSTALLATION

WINDOW REGULATOR

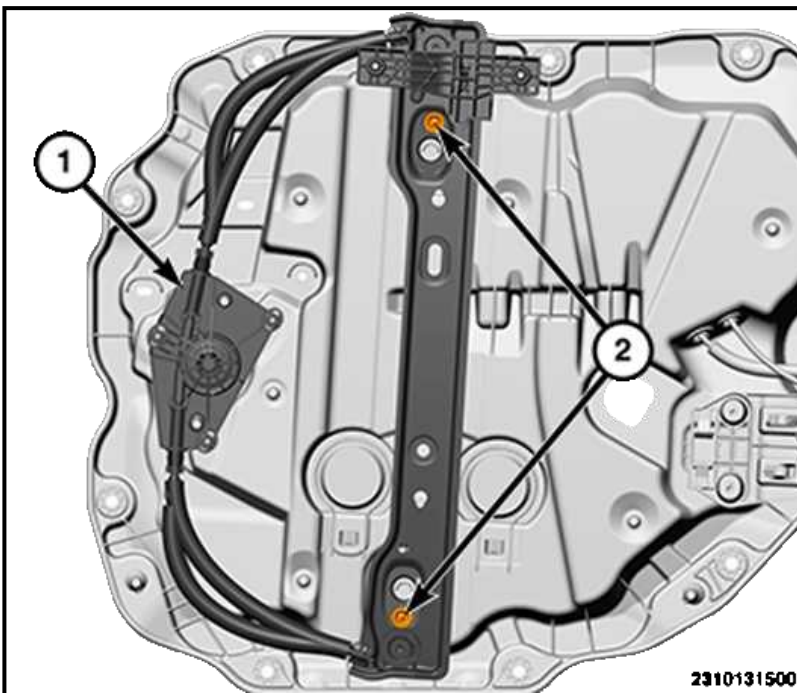
REMOVAL

1. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



1 -Socket
2 - Window Motor Post

2. Use a small socket or equivalent to aid releasing the window motor posts from the carrier plate.



1 - Regulator
2 - Fasteners

3. Remove the fasteners and remove the regulator.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

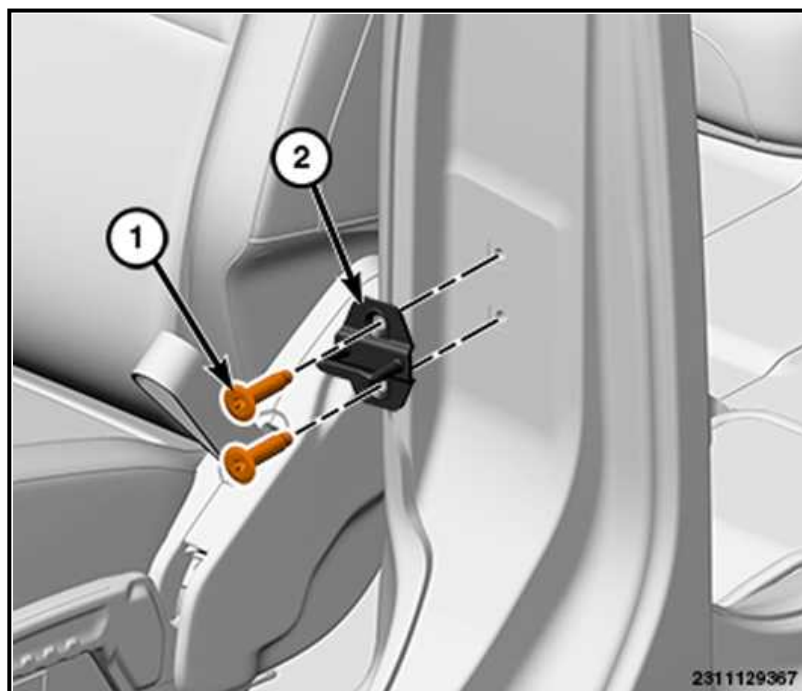
- All fasteners are tightened securely.

STRIKER, DOOR LATCH

REMOVAL AND INSTALLATION

DOOR LATCH STRIKER

REMOVAL



1 - Door Striker Bolt

2 - Door Latch Striker

NOTE: The front door and rear door latch strikers are removed the same way.

1. Using a grease pencil or equivalent, mark the position of the door latch striker to aid installation.
2. Remove the door striker bolts and the door latch striker.

NOTE: If any shims are used between the door latch striker and body, reuse them during installation.

INSTALLATION

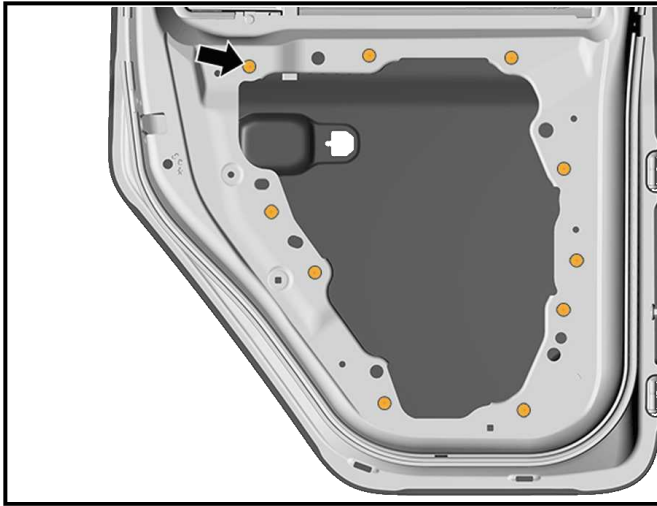
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Align the door latch striker with the reference mark made previously and tighten the door latch striker bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Verify door fit and operation. Adjust the door latch striker if necessary. Refer to [GAP AND FLUSH, SPECIFICATIONS](#).

DOORS - REAR, FULL

STANDARD PROCEDURE

STANDARD PROCEDURE - CLINCH NUT REPAIR



2310131146

Cross-Threaded Clinch Nut

1. Drill out threads by drilling 6.3 mm (0.25 in.) hole through clinch nut.
2. Tap length of hole for an M6 - 1.0 thread.
3. Install 06101025 (M6 Heli-Coil) so that the Heli-Coil is at or just below surface of clinch nut.
4. Break off tang at end of Heli-Coil.

Missing Clinch Nut

Option 1 - Coupon And Clinch Nut

1. Obtain 1.0 mm (0.04 in.) thick aluminum (MS.50005-AA6000-HF P1 U) coupon (25 mm x 25 mm) (1.0 in. x 1.0 in.).
2. Place coupon over hole area to verify there is enough space to weld coupon onto inner panel.
3. Drill a 10 mm (0.4 in.) hole in center of coupon for installation of clinch nut.
4. Align hole of coupon with hole of inner panel where the clinch nut is missing. TIG weld coupon over hole location.
5. Install 06511973AA (M6 clinch nut) using the clinch nut installation tool.
6. Paint the surrounding areas for corrosion protection as per PSOP 8500.

Option 2 - New Clinch Nut

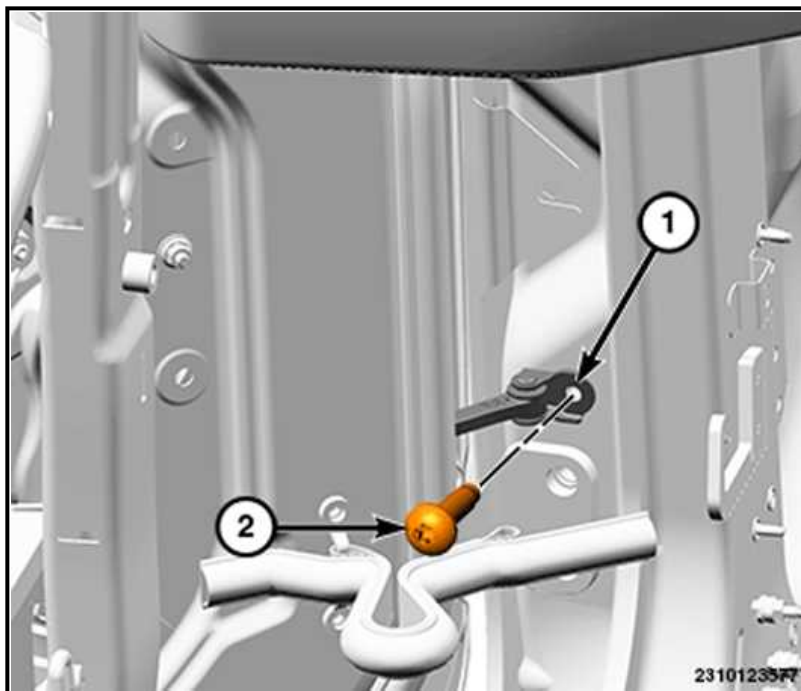
1. Dip clinch nut in zinc-rich primer (PPG 1808 or MS-PB7-5) and install wet clinch nut 06511973AA using clinch nut installation tool.

CHECK, DOOR

REMOVAL AND INSTALLATION

DOOR CHECK

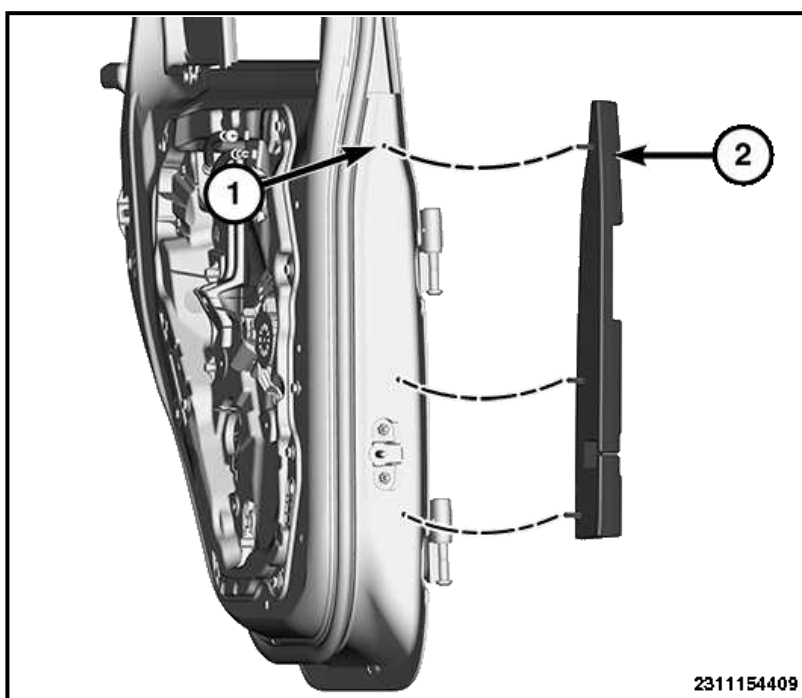
REMOVAL



1 - Door Check

2 - Door Check Strap Bolt

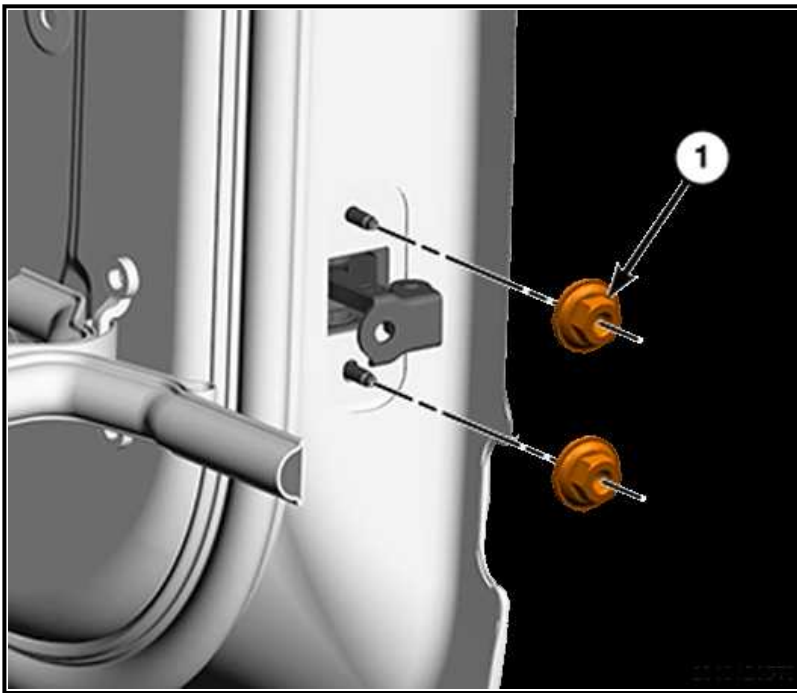
1. Open the door and remove the door check strap bolt connecting the door check to the B-pillar.
2. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



1 - Door Frame

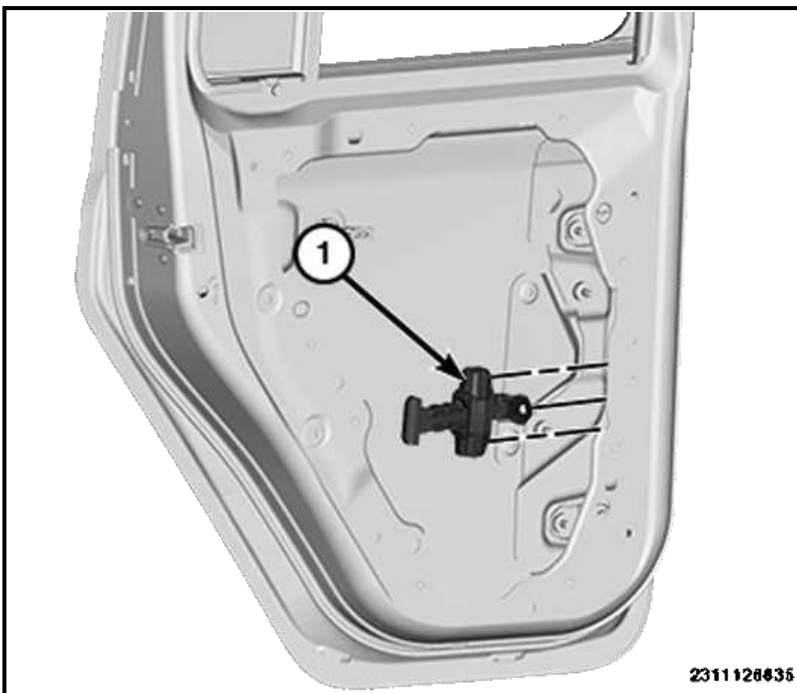
2 - Foam Stuffer

3. Remove the foam stuffer from the door frame.



1 - Door Check Strap Nut

4. Remove the door check strap nuts securing the door check strap to the door.



1 - Door Check Strap

5. Remove the door check strap from the door opening.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the door check strap nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the door check strap bolt to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

DOOR, REAR

REMOVAL AND INSTALLATION

REAR DOOR

REMOVAL



1 - B-Pillar Trim Cover

1. Using a trim stick, release and remove the B-pillar trim cover.

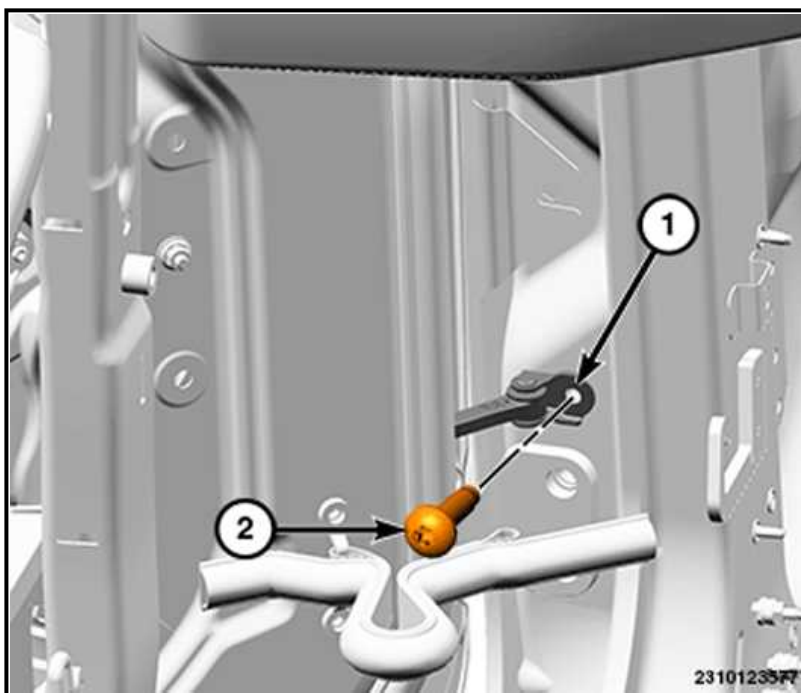


1 - Support Bracket

2 - Wire Harness Connector

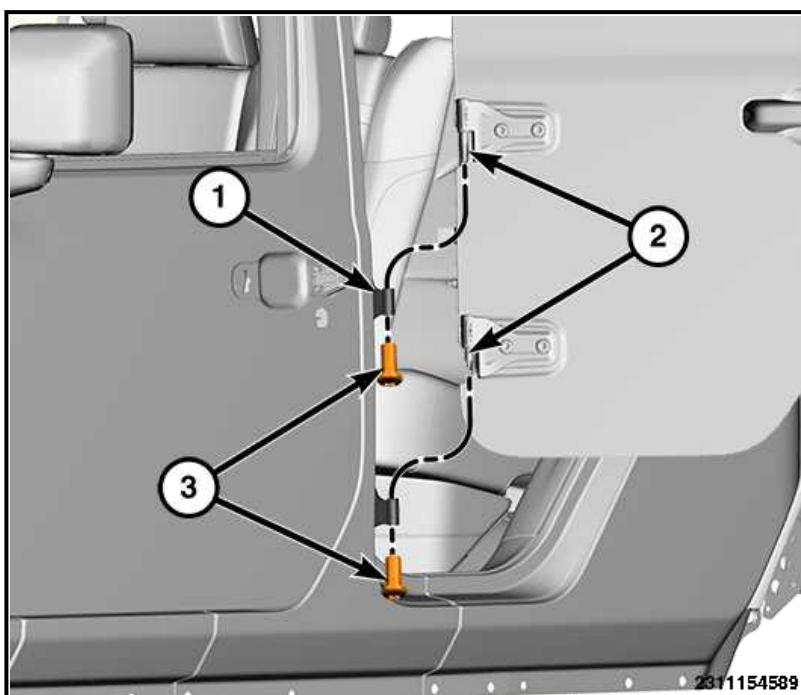
3 - Wire Harness

2. Disconnect the wire harness connector and release the wire harness from the support bracket.



- | |
|---------------------------|
| 1 - Door Check Strap |
| 2 - Door Check Strap Bolt |

3. Remove the door check strap bolt securing the door check strap.



- | |
|---------------------------|
| 1 - Hinge |
| 2 - Pins |
| 3 - Door Hinge Pivot Nuts |

4. Remove the door hinge pivot nuts and lift the door up off hinges and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Align pins on door hinges to holes in hinges on body and position door into place.

- Install the door hinge pivot nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the door check strap bolt and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- If necessary, adjust the door. Refer to [GAP AND FLUSH, SPECIFICATIONS](#).
- Verify the B-Pillar wiring cover is fully seated.

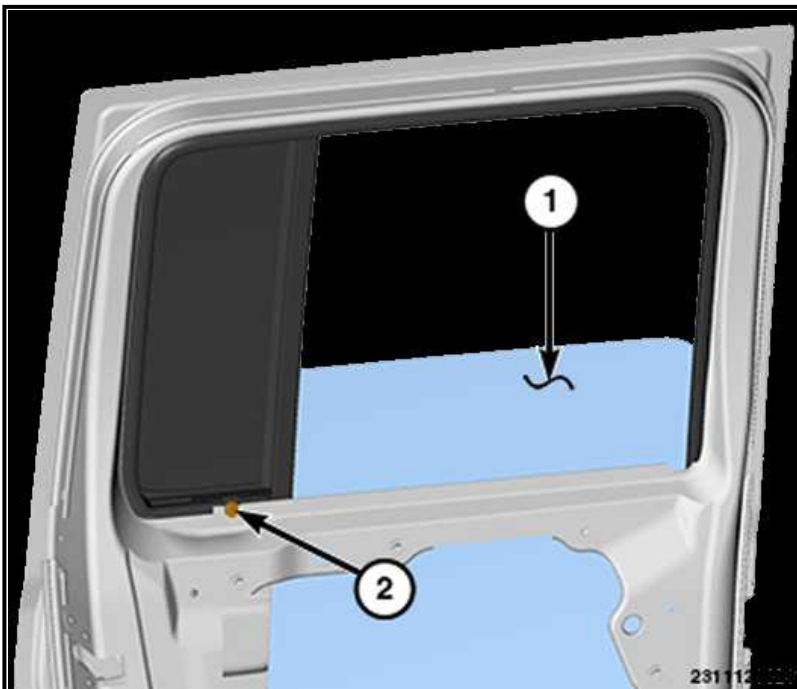
GLASS, DOOR

REMOVAL AND INSTALLATION

DOOR GLASS

REMOVAL

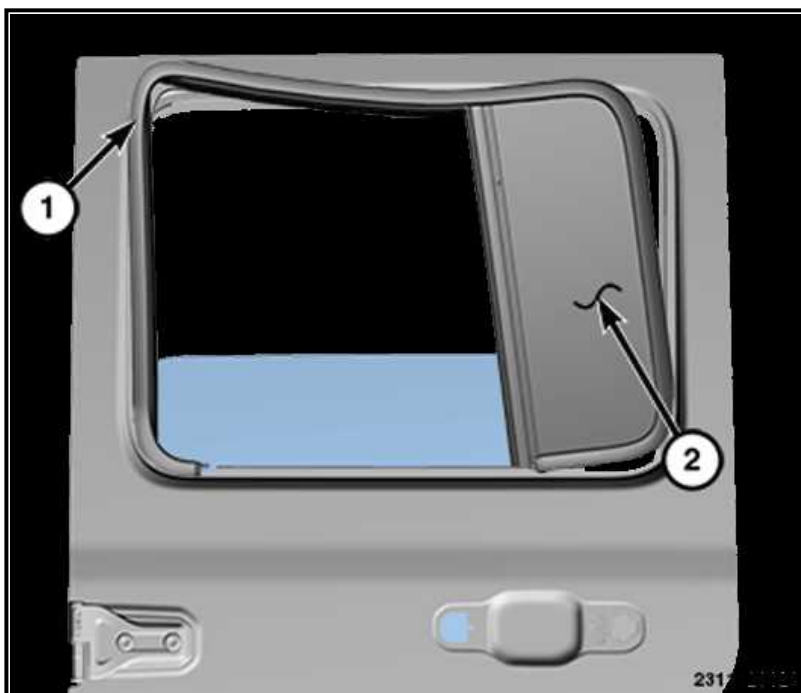
1. Remove the outer belt molding from the door. Refer to [MOLDING, DOOR BELT, OUTER, REMOVAL AND INSTALLATION](#).
2. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



1 - Glass
2 - Door Stationary Glass Fastener

NOTE: Left side shown in illustration, right side similar.

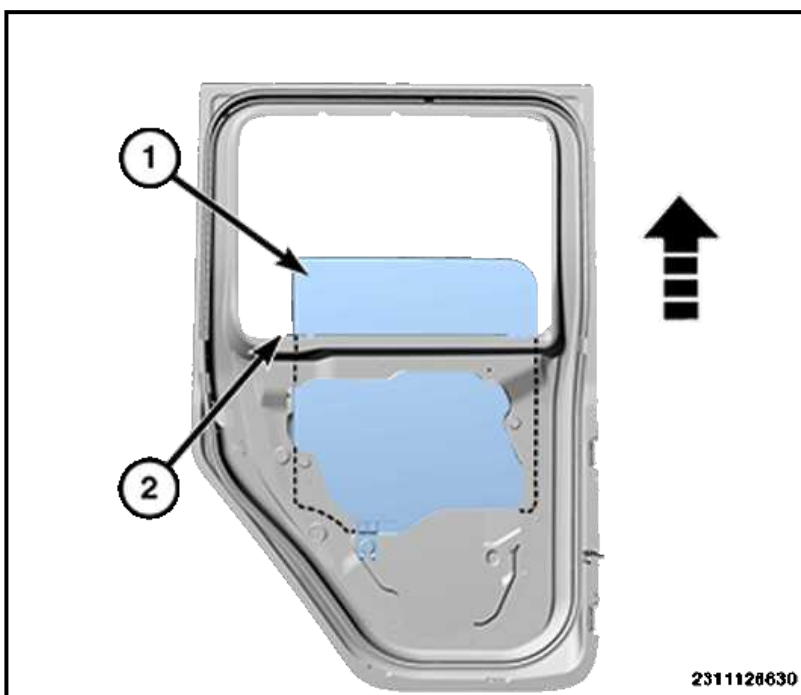
3. Slide the glass down to the bottom of the door.
4. Remove the inner belt molding from the door.
5. Remove the door stationary glass fastener securing the fixed glass into the door.



1 - Weather Strip

2 - Stationary Glass

6. Separate the weather strip from the window frame and remove the stationary glass and weather strip from the door.



1 - Door Glass

2 - Window Opening

WARNING: Use care when removing the door glass to prevent breakage. Do not force the glass out of the door. Failure to follow this warning may result in serious injury.

7. Carefully remove the door glass from the window opening.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Carefully lower the glass in through the window opening and rest in the bottom of the door.
- Position the stationary glass and the weather strip into the window frame and seat fully.
- Install the door stationary glass fastener and tighten to the proper. Refer to [**TORQUE SPECIFICATIONS**](#) .

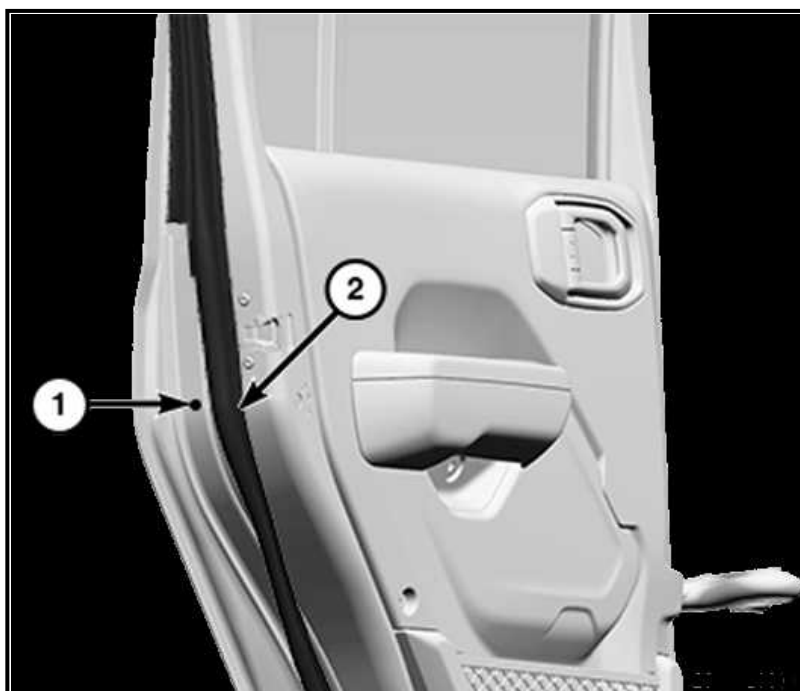
HANDLE, EXTERIOR

REMOVAL AND INSTALLATION

EXTERIOR HANDLE

REMOVAL

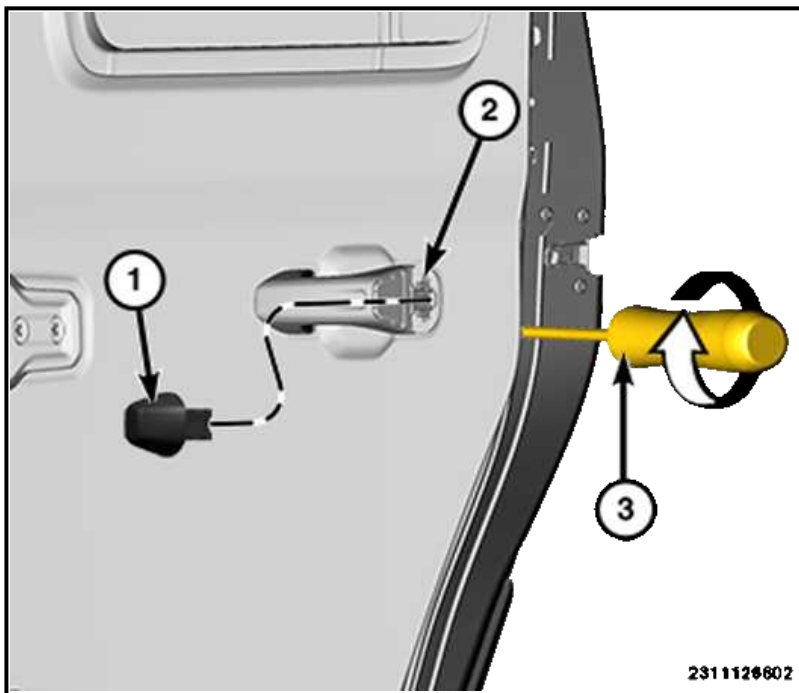
NOTE: Left hand shown in illustration, right hand similar.



1 - Slide Plate Screw

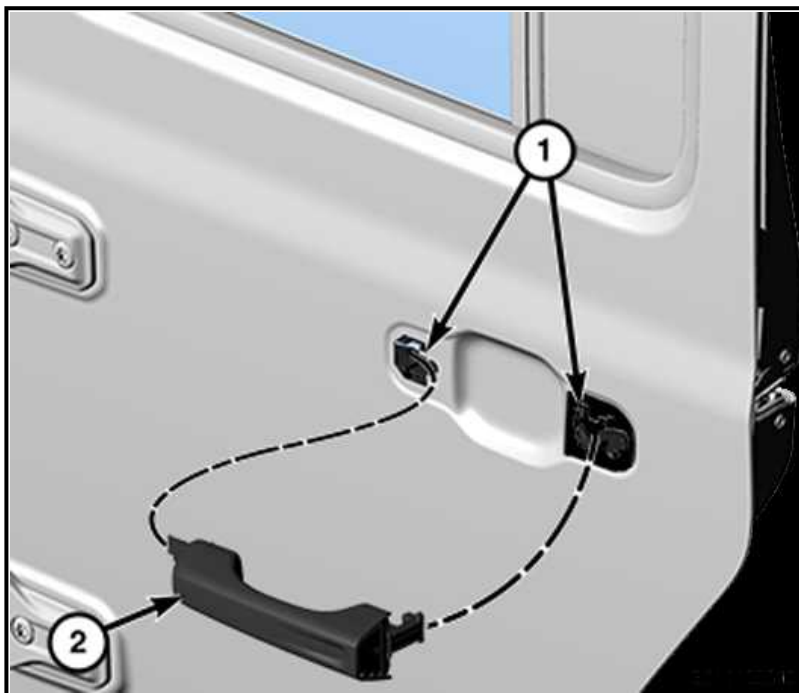
2 - Weather strip

1. Position the weather strip aside to access the slide plate screw located rearward of the cap.



1 - Door Handle Cap
2 - Outside Door Handle Gasket
3 - Tool

- Using a suitable tool, turn the screw counter-clockwise to move the slide plate forward in the outside door handle gasket. **Do not attempt to remove the slide plate screw.**
- Continue to turn the screw while lightly pulling on the door handle cap until the cap is removed.



1 - Door
2 - Handle

- Pull the handle out slightly, then slide the handle rearward and out.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Position the handle to the door and gasket.
- Slide the handle in and forward.
- Once properly positioned and while pushing the handle cap against the handle gasket, tighten the screw accessible rearward of the handle to the proper and position the weather strip back into place. Refer to [TORQUE SPECIFICATIONS](#) .

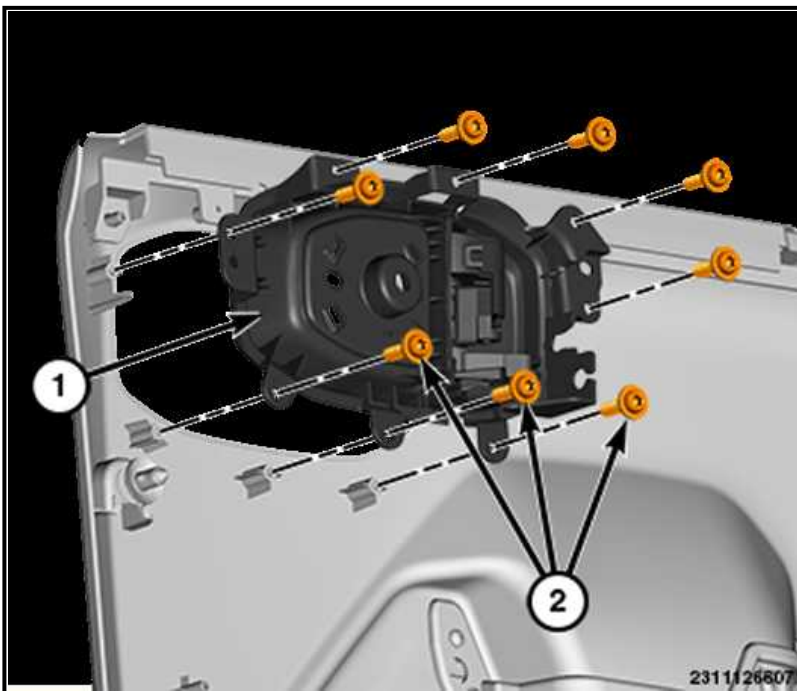
HANDLE, INTERIOR

REMOVAL AND INSTALLATION

INTERIOR HANDLE

REMOVAL

1. Remove the front door trim panel. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#).



1 - Interior Handle
2 - Bezel Fasteners

2. Disconnect the wire harness connectors as necessary.
3. Remove the bezel fasteners.
4. Remove the interior handle from the door trim panel.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

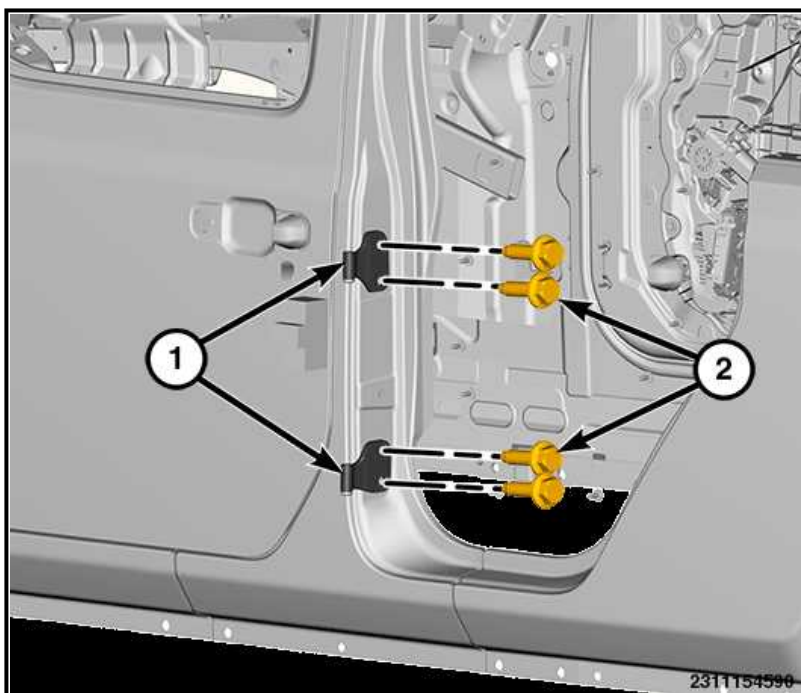
HINGE, DOOR

REMOVAL AND INSTALLATION

DOOR HINGE

REMOVAL

1. Remove the door. Refer to [DOOR, REAR, REMOVAL AND INSTALLATION](#).

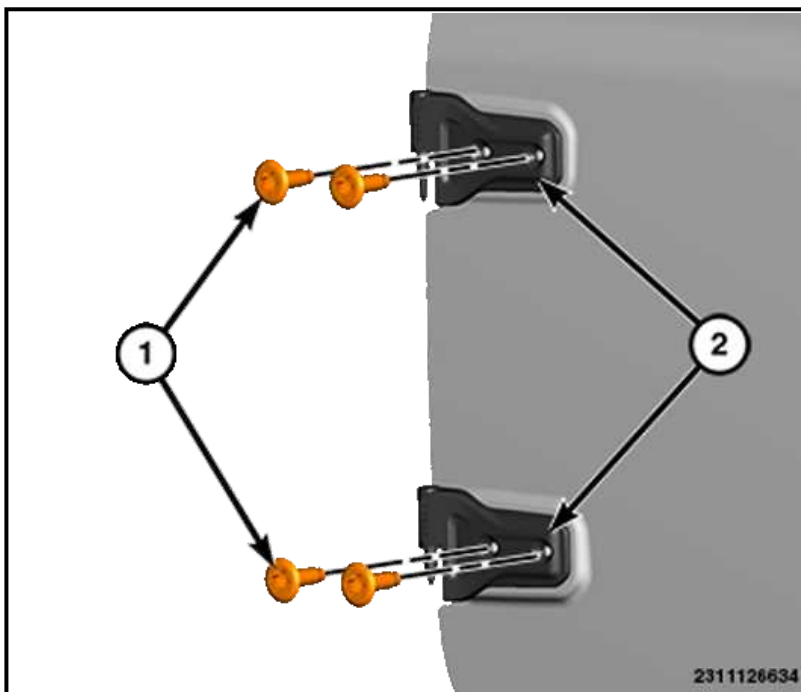


1 - Body Side Hinge

2 - Door Hinge Body Bolts

2. Using a grease pencil or equivalent, mark the position of the door hinge on the door and on the body to aid installation.

3. Remove the door hinge to body bolts and remove the body side hinge.



1 - Door Hinge Bolts

2 - Door Side Hinge

4. Remove the door hinge to door bolts and remove the door side hinge.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- A suitable body sealant should be used when removing or moving the hinges.
- Position the door hinge and loosely install the door side bolts.
- Align the door hinge to the reference marks made previously and tighten door side bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Position the body side door hinge and loosely install the body side bolts.
- Align the body side door hinge to the reference marks made previously and tighten the body side door hinge bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- If necessary, adjust the door. Refer to [GAP AND FLUSH, SPECIFICATIONS](#).

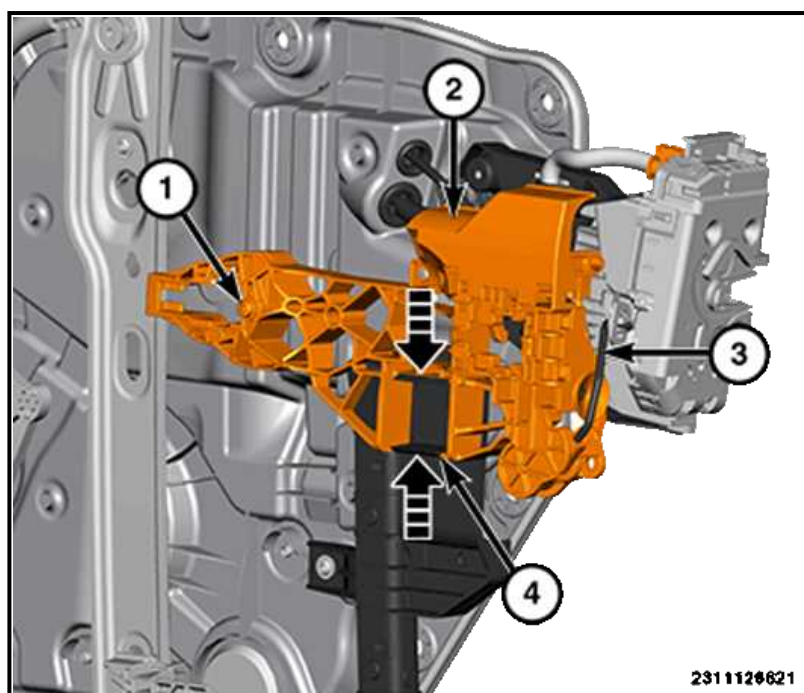
LATCH, DOOR

REMOVAL AND INSTALLATION

DOOR LATCH

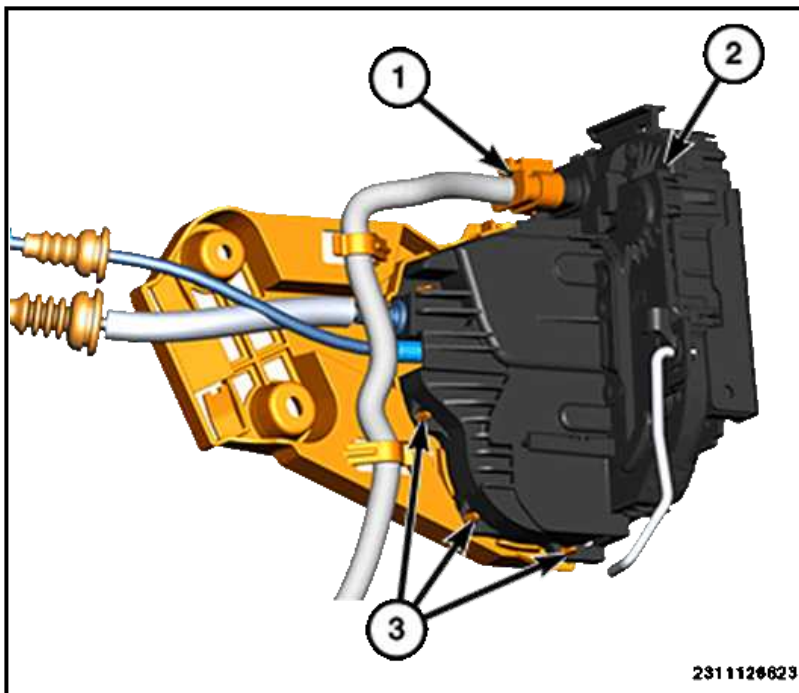
REMOVAL

1. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



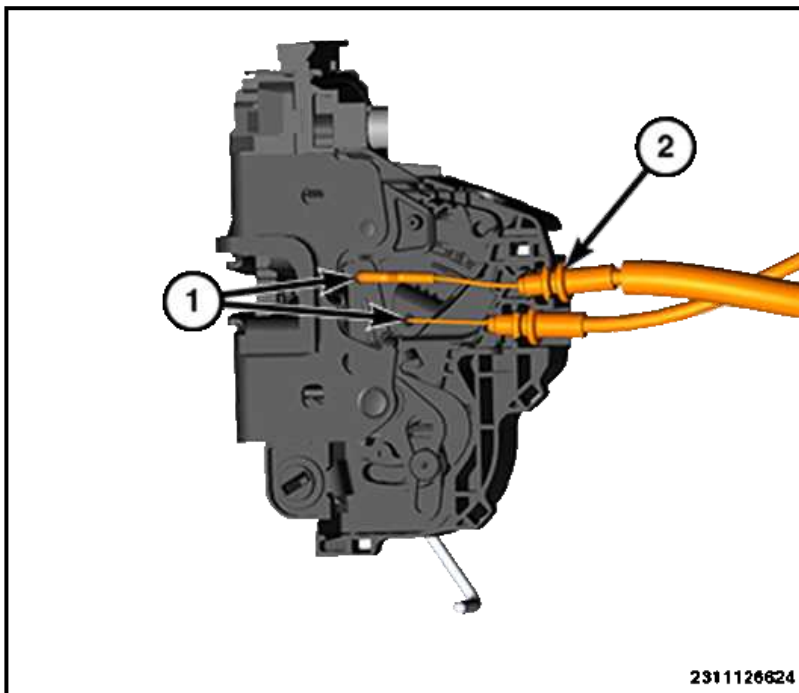
1 - Fasteners
2 - Handle Bracket
3 - Actuator Rod
4 - Clip

2. Remove the fasteners for the handle bracket.
3. Disconnect the actuator rod.
4. Release the clips and remove the handle bracket from the latch and presenter bracket.



1 - Wire Harness Connector
2 - Latch
3 - Latch Cover Tabs

5. Disconnect the wire harness connector.
6. Release the latch cover tabs and remove the latch from the presenter bracket.



1 - Cable Ends
2 - Handle and Lock Cable

7. Disconnect the handle and lock cables and remove the cable ends from the latch assembly.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

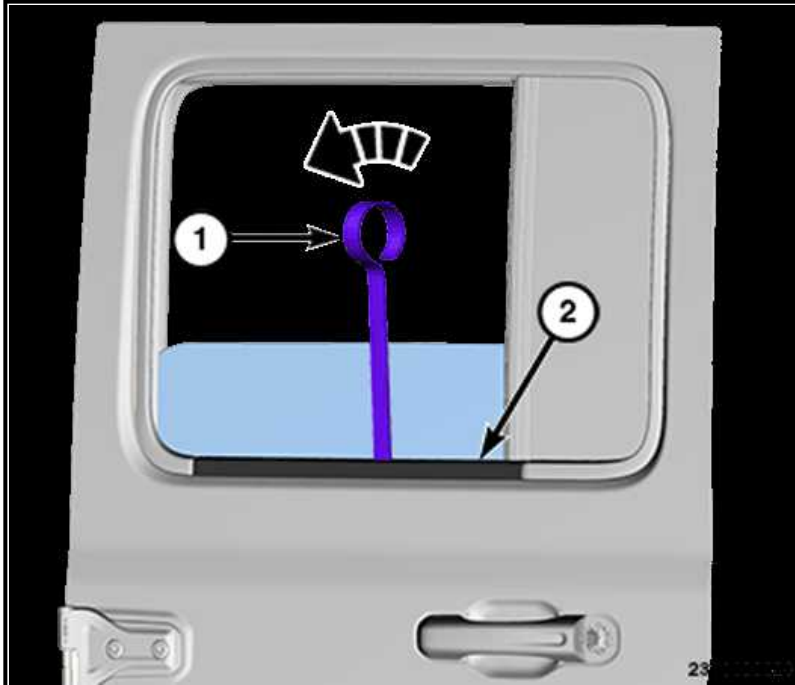
- All fasteners are tightened securely.

MOLDING, DOOR BELT, OUTER

REMOVAL AND INSTALLATION

DOOR BELT OUTER MOLDING

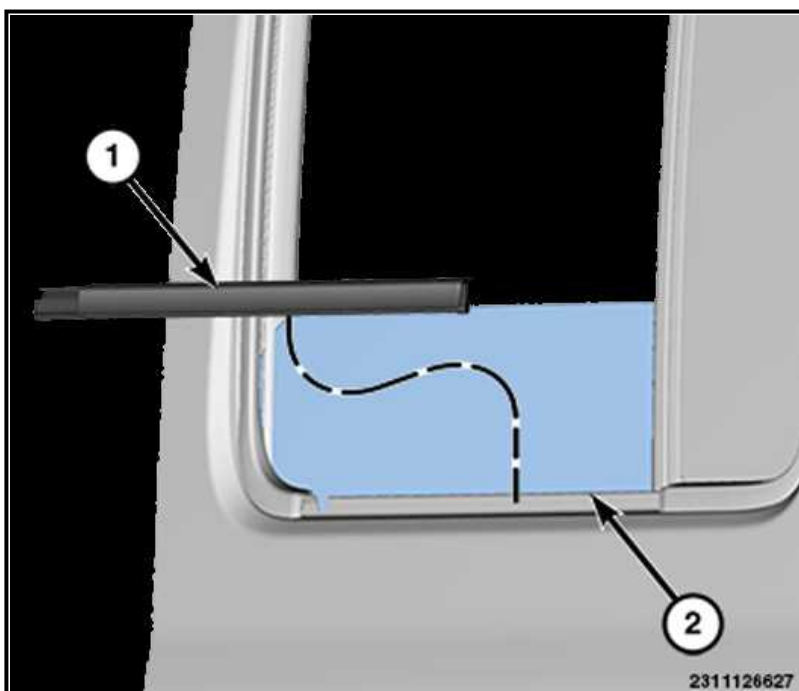
REMOVAL



1 - Tool

2 - Outer Belt Molding

1. Lower the door glass fully.
2. Using special tool (special tool #9093, Remover, Belt Moldings) between belt molding and glass, push down on outer belt molding and rotate upper part of tool outward from vehicle approximately 6-8 cm (2.5-3.0 in.) then lift up on molding to disengage from locking tabs.



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- | |
|--------------------------|
| 1 - Belt Molding |
| 2 - Glass Opening Flange |

3. Remove the belt molding from the glass opening flange.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

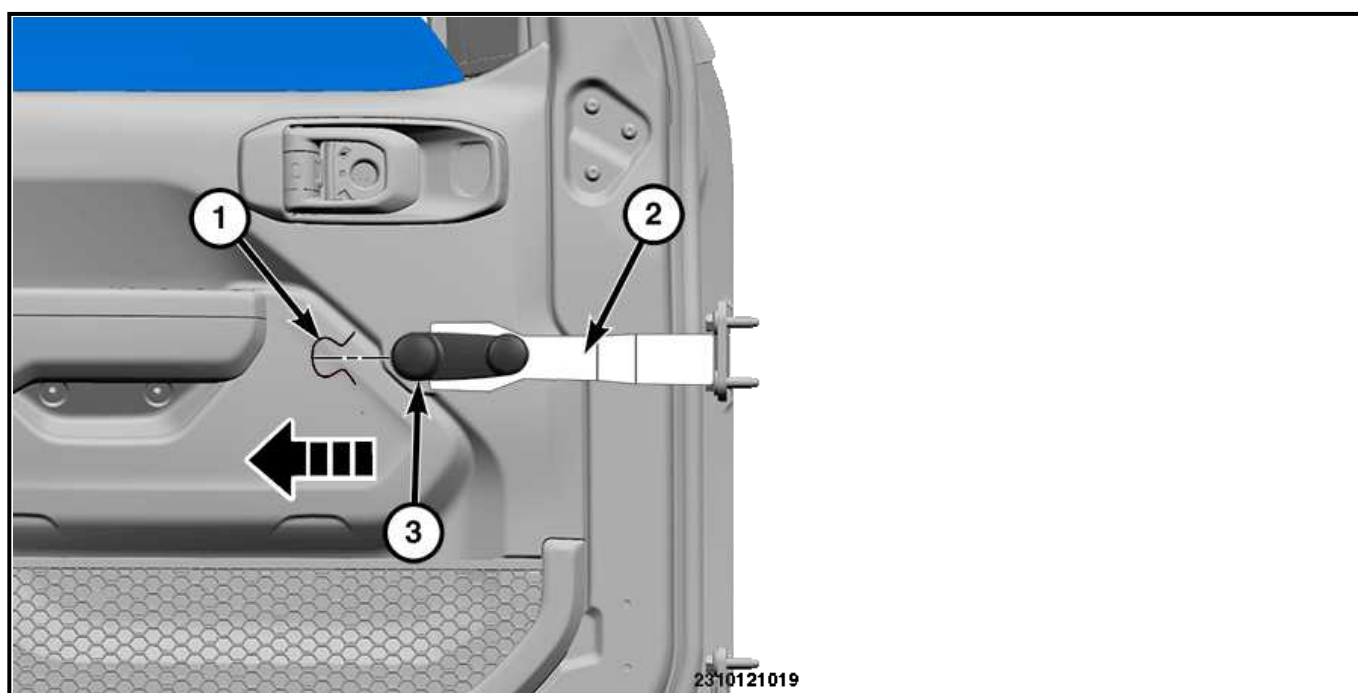
- All fasteners are tightened securely.

PANEL, REAR DOOR TRIM

REMOVAL AND INSTALLATION

REAR DOOR TRIM PANEL

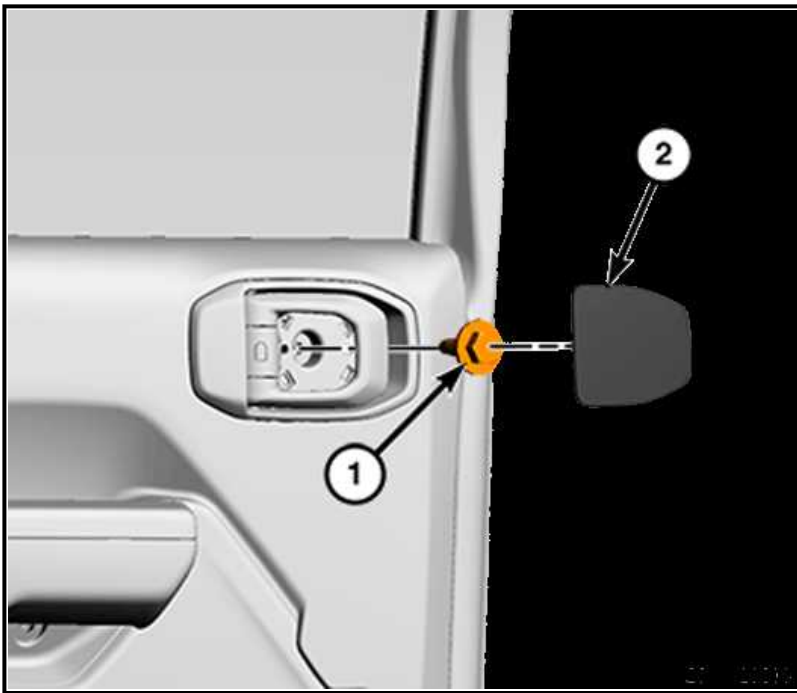
REMOVAL



- | |
|---------------------------------|
| 1 - Handle Clip |
| 2 - Standard Window Handle Tool |
| 3 - Handle |

1. Using a standard window handle tool, release the handle clips and remove the handle from the window lift mechanism, if equipped with a manual regulator.

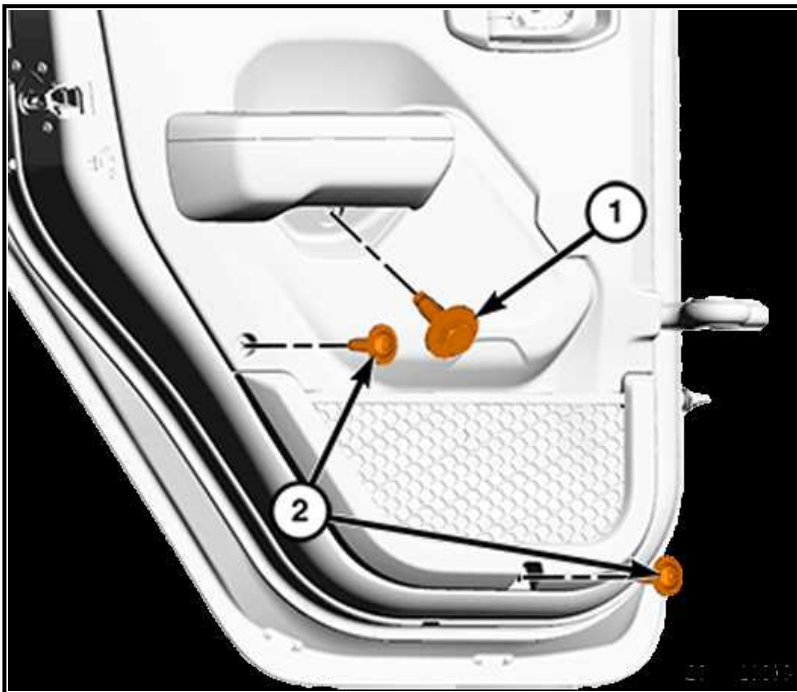
Front door shown in illustration, rear door similar.



1 - Door Interior Handle Bolt

2 - Trim Cover

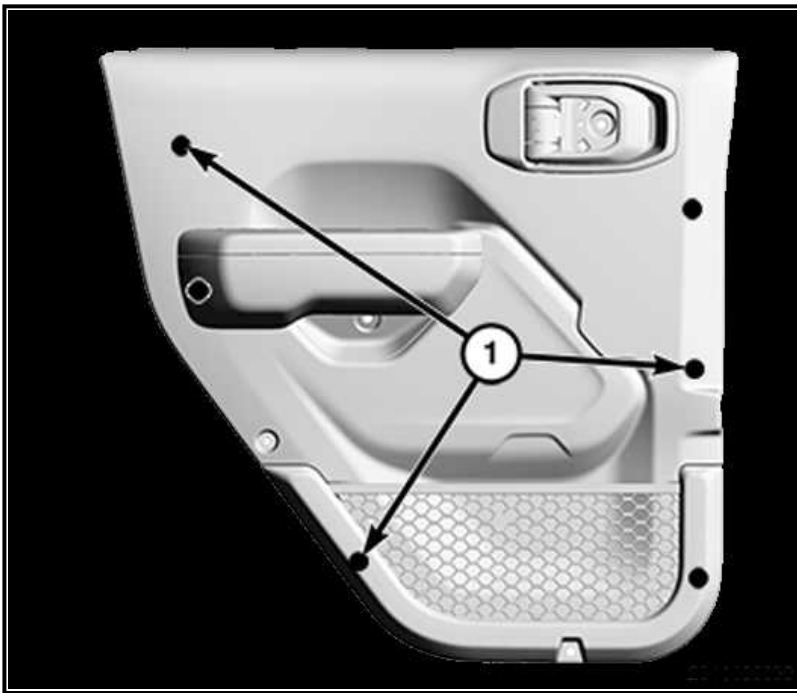
2. Using a small pick type tool or equivalent, inserted into the slot, remove the trim cover.
3. Remove the door interior handle bolt.



1 - Door Armrest Bolt

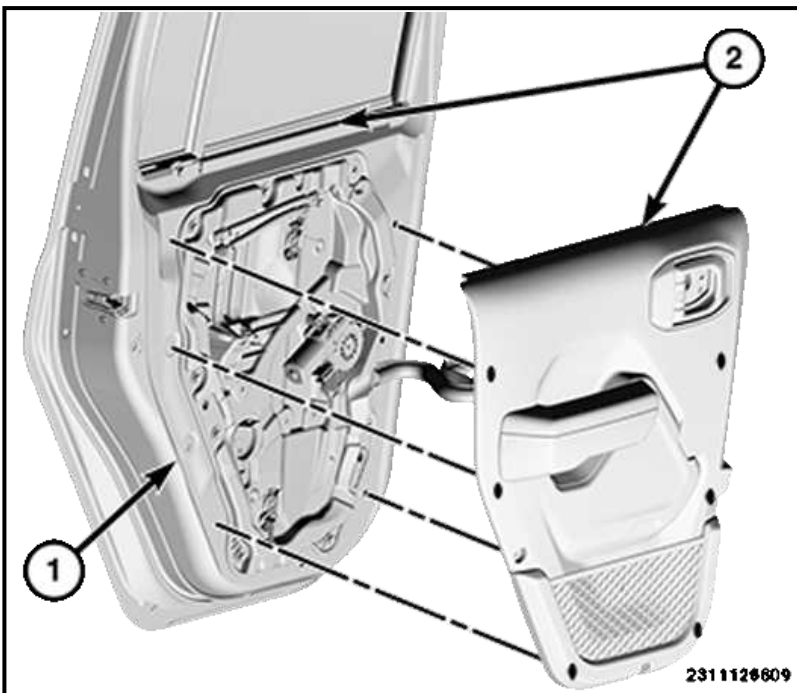
2 - Fasteners

4. Remove the fasteners and the door armrest bolt.



1 - Push Pin Fasteners

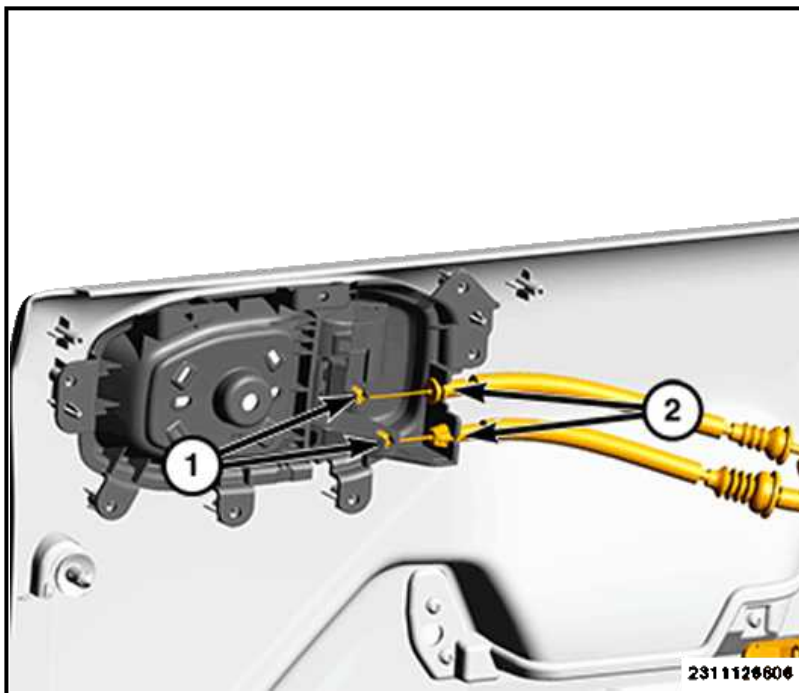
5. Using special tool (special tool #C-4829A, Remover, Trim), separate the six push pin fasteners.



1 -Door

2 - Trim Panel Assembly

6. Separate the trim panel assembly from the door.



1 - Interior Cable Ends
2 - Cable Housings

7. Disconnect the wire harness connectors as necessary.

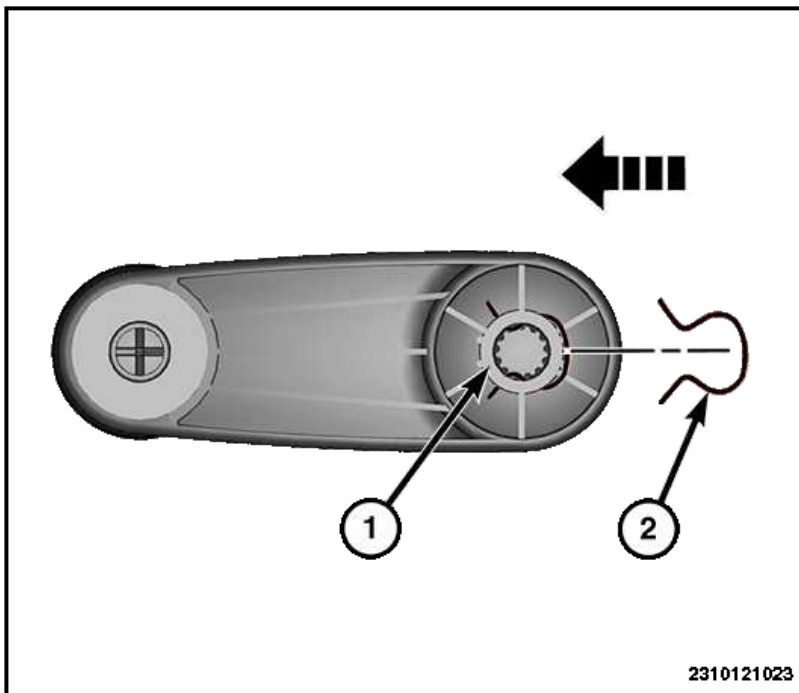
8. Release the cable housings then disconnect the interior handle cable ends and remove the trim panel assembly.

NOTE: Prior to installing the door trim panel, replace any trim panel retaining clips that may have been damaged during the removal process.

INSTALLATION

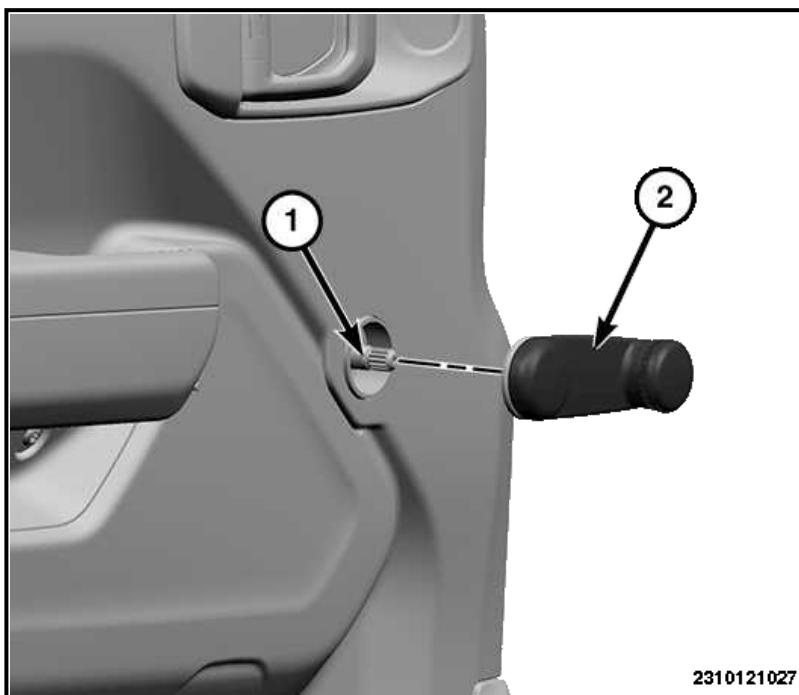
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Hand tap panels to seat fully.
- Verify panel alignment and tab engagement.
- Install the door armrest bolt and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the door interior handle bolt and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



1 - Window Handle Crank Hub
2 - Window Crank Handle Retaining Clip

- If equipped with a manual window regulator, position the window crank handle retaining clip back into place on the window crank handle hub.



1 - Window Handle
2 - Post

NOTE: Front door shown in illustration, rear door similar.

- Position the window handle back onto the post and seat fully.

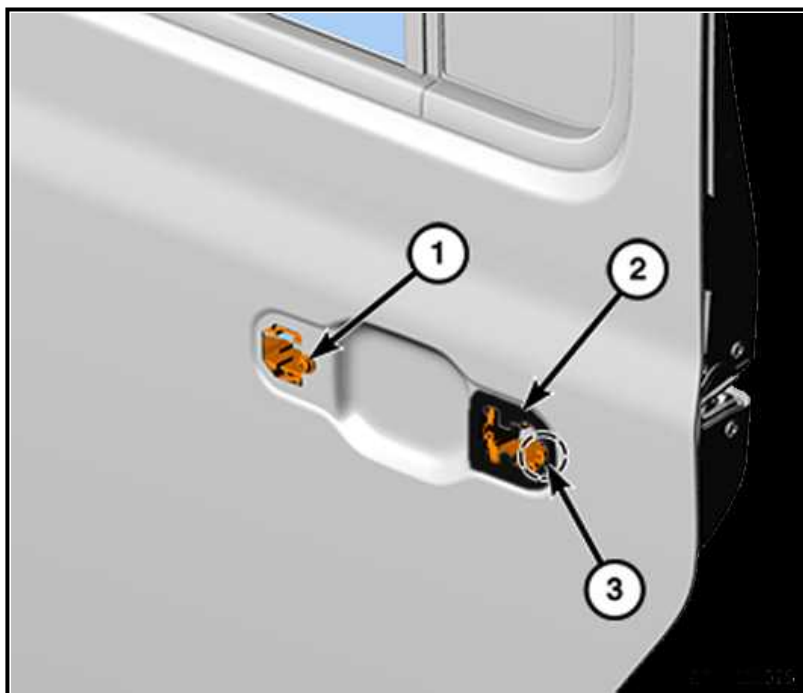
PLATE, CARRIER

REMOVAL AND INSTALLATION

CARRIER PLATE

REMOVAL

1. Remove the exterior handle. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#).

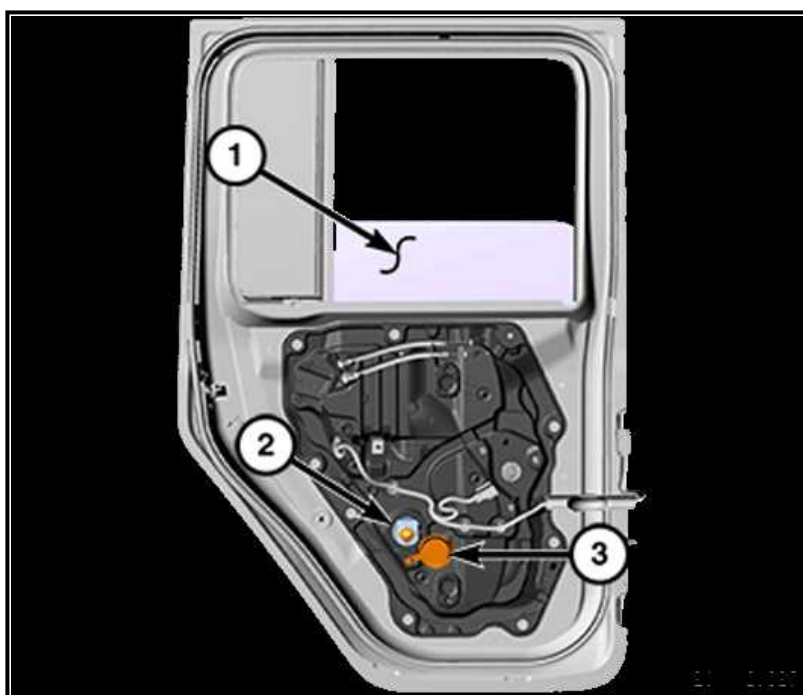


1 - Exterior Handle Support Screw

2 - Handle Gasket

3 - Hook

2. Remove the handle gasket.
3. Loosen the exterior handle support screw but do not remove it, and slide the handle bracket forward.
4. Remove the door trim panel. Refer to [PANEL, REAR DOOR TRIM, REMOVAL AND INSTALLATION](#).

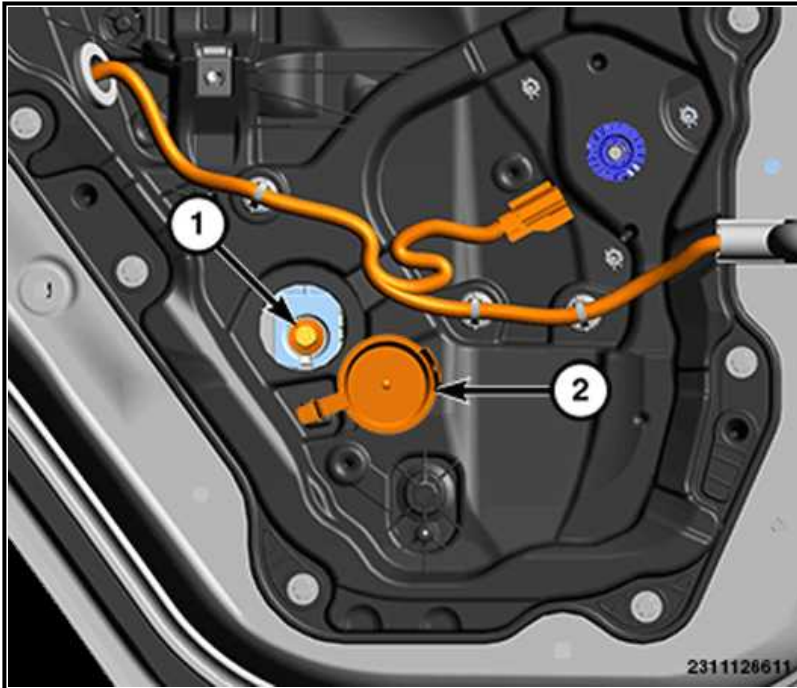


1 - Window

2 - Access Hole

3 - Access Plug

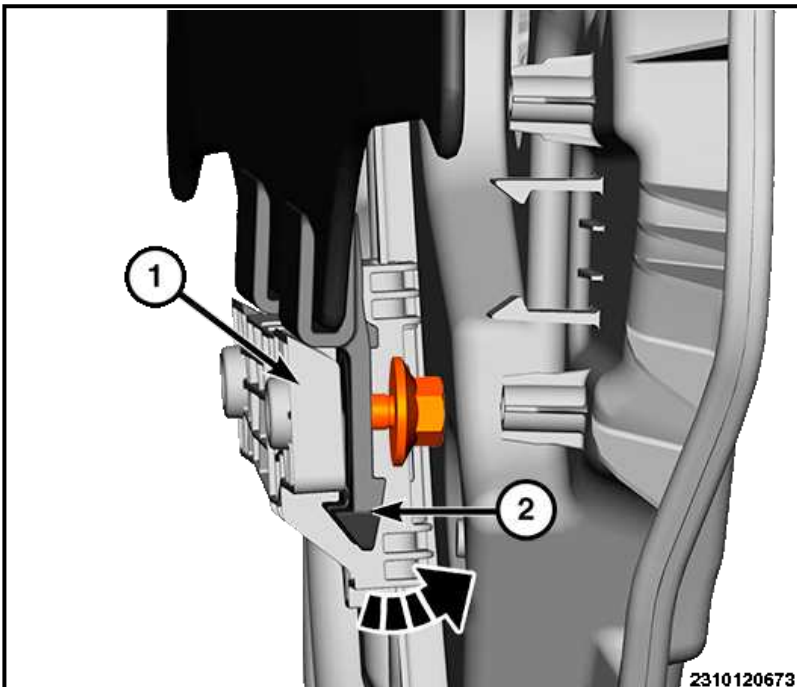
5. Open the access plug and position aside.
6. Remove the window motor and lower the window until the door glass bolt is visible in the access hole.
Refer to **MOTOR, WINDOW REGULATOR, REMOVAL AND INSTALLATION**.



1 - Door Glass Bolt

2 - Access Plug

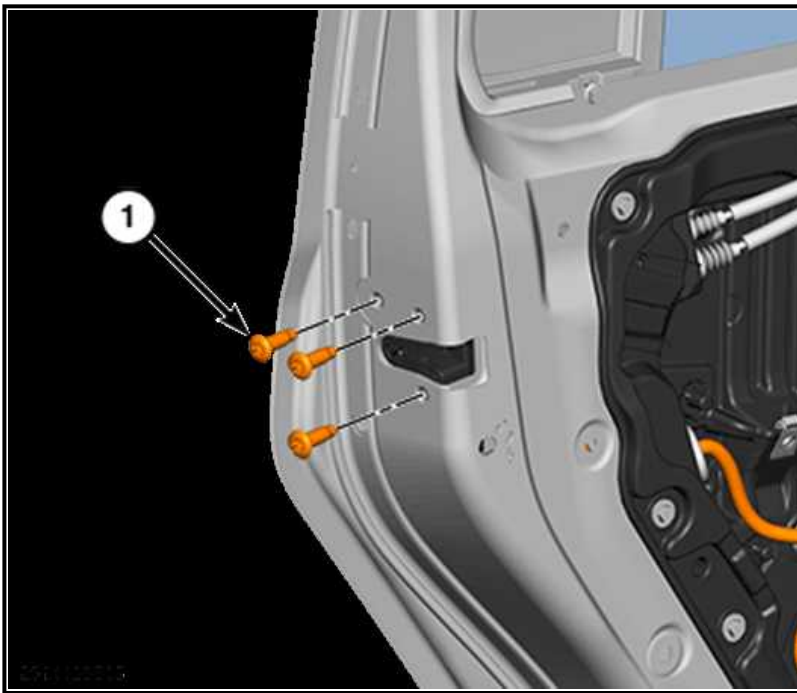
7. Loosen the door glass bolt.



1 - Regulator Lift Plate

2 - Lower Glass Tabs

8. Using a hook-type tool or equivalent, release the lower glass tabs from the regulator lift plates.
9. Secure the window glass into place with a wedge or tape.



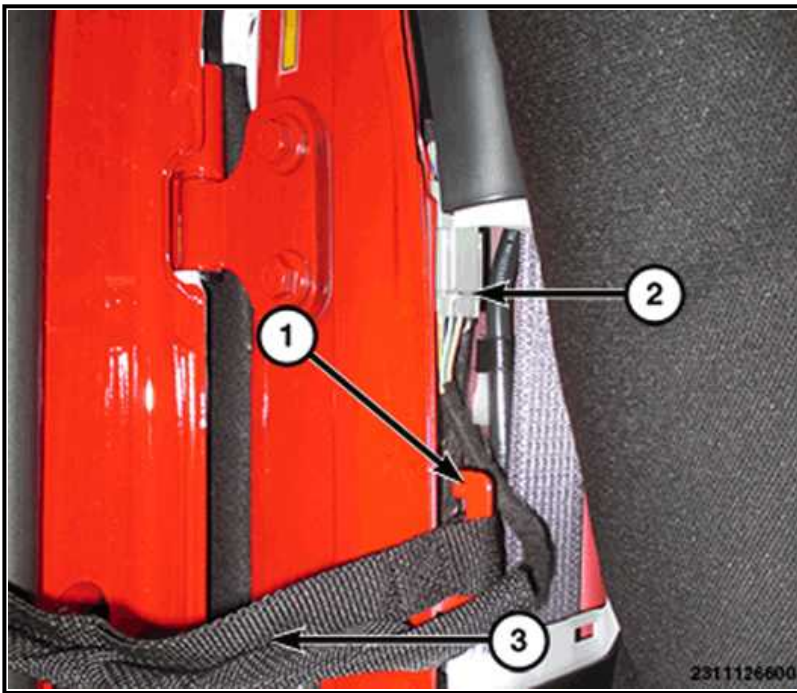
1 - Door Latch Mounting Bolts

10. Remove the door latch mounting bolts.



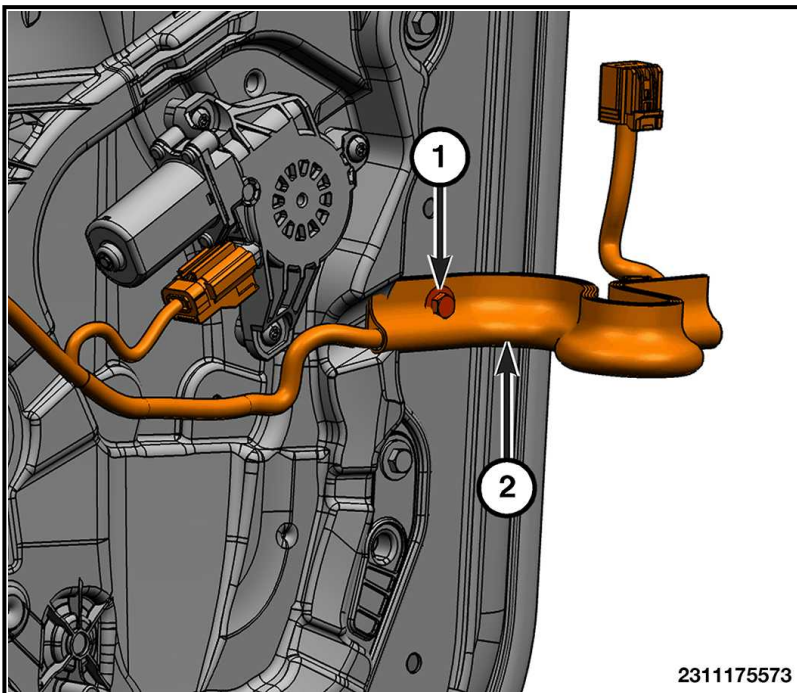
1 - B-Pillar Trim Cover

11. Using a trim stick, release and remove the B-pillar trim cover.



- | |
|----------------------------|
| 1 - Support Bracket |
| 2 - Wire Harness Connector |
| 3 - Wire Harness Strap |

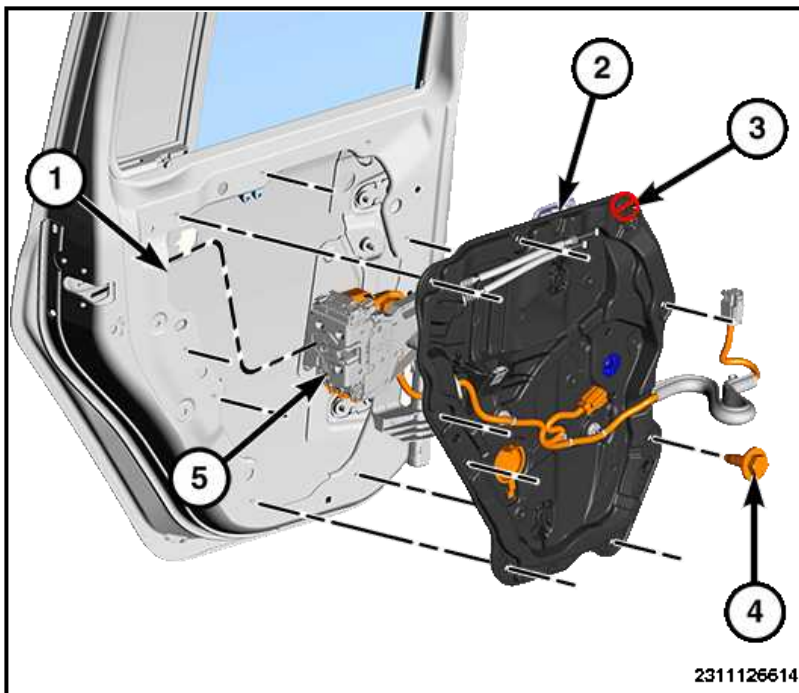
12. Disconnect the wire harness connector and release the wire harness strap from the support bracket.



- | |
|-----------------------|
| 1 - Screw |
| 2 - Door Wire Harness |

13. Release the wire harness support clips.

14. Remove the screw securing the door wire harness bracket to the front of the door.



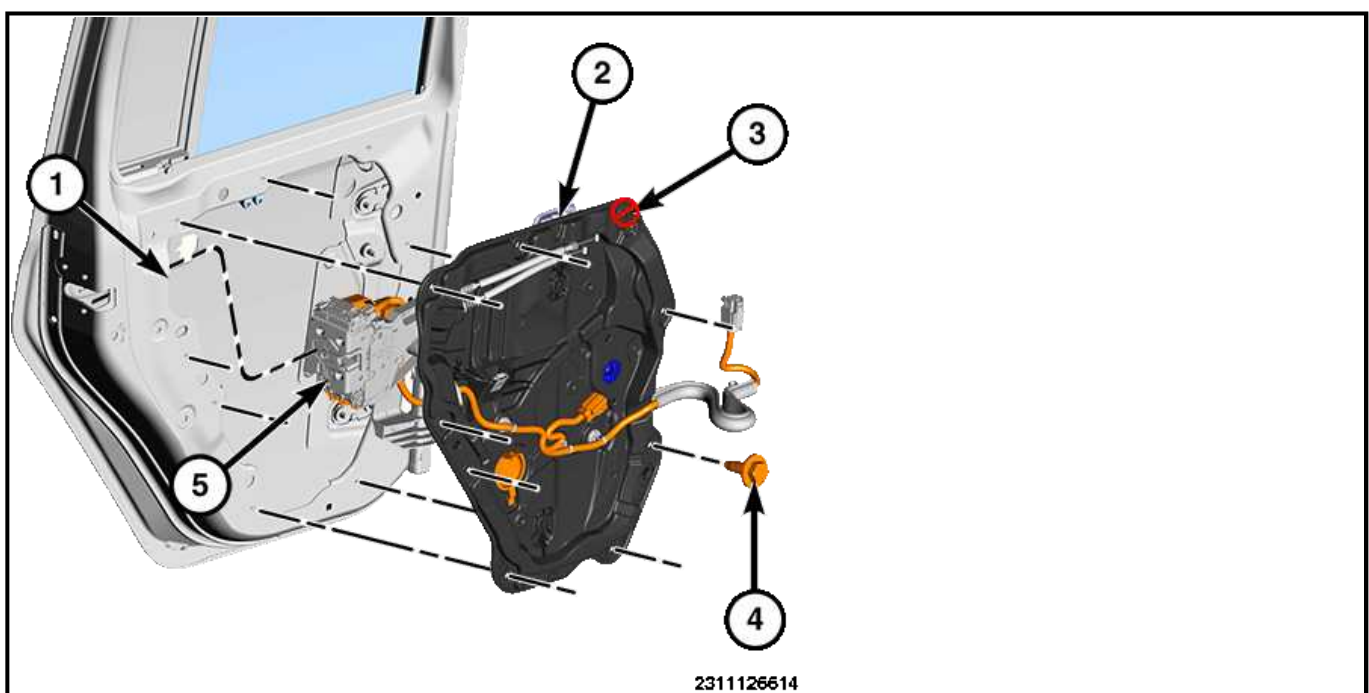
1 - Door Interior
2 - Carrier Plate Assembly
3 - This bolt hole is a locator used during the trim panel removal and installation. (Do Not Add Bolt.)
4 - Carrier Plate Bolt
5 - Latch Assembly

15. Remove the carrier plate bolts and separate the carrier plate assembly from the door.

16. Move the assembly forward in the door and remove the latch assembly from the door interior and remove the carrier plate.

INSTALLATION

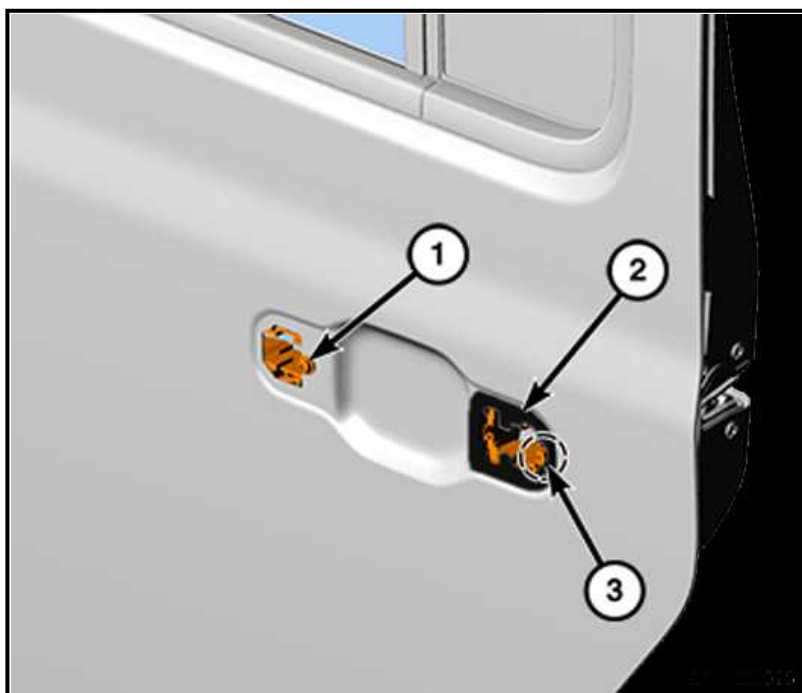
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.



1 - Door Interior

2 - Carrier Plate Assembly
3 - This Bolt Hole Is A Locator Used During The Trim Panel Removal And Installation. (Do Not Add Bolt)
4 - Carrier Plate Bolt
5 - Latch Assembly

- Do not add a bolt to hole. This bolt hole is used during the trim panel removal and installation.
- Install the door latch screws and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Position the door glass and secure it to the window regulator glass sliders, making sure the glass and lift plates are properly seated.
- Tighten the door glass bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



1 - Exterior Handle Support Screw
2 - Handle Gasket
3 - Hook

- While pushing the hook rearward, tighten the exterior handle support screw to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

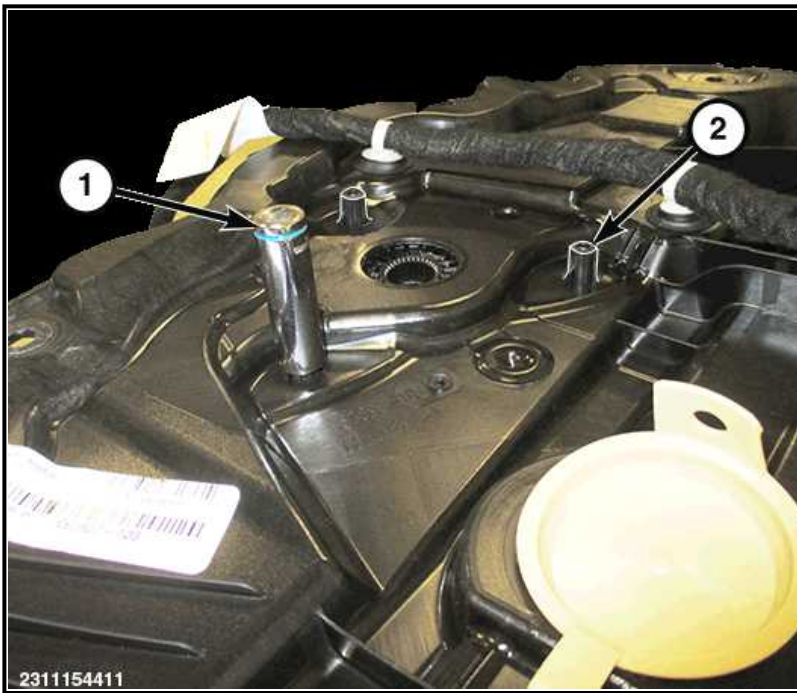
REGULATOR, WINDOW

REMOVAL AND INSTALLATION

WINDOW REGULATOR

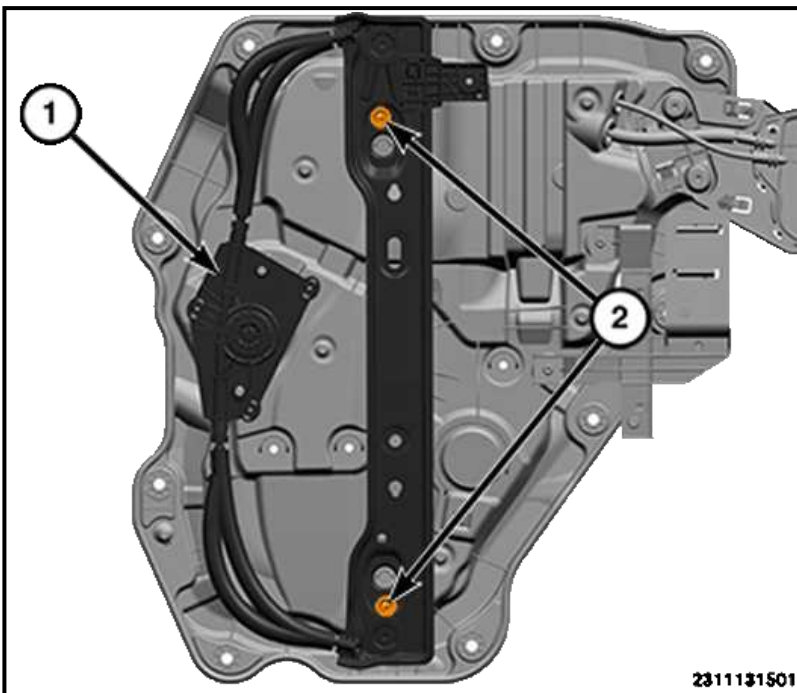
REMOVAL

1. Remove the carrier plate. Refer to [PLATE, CARRIER, REMOVAL AND INSTALLATION](#).



1 - Socket
2 - Window Motor Post

2. Use a small socket or equivalent to aid releasing the window motor posts from the carrier plate.



1 - Regulator
2 - Fasteners

3. Remove the fasteners and remove the regulator.

INSTALLATION

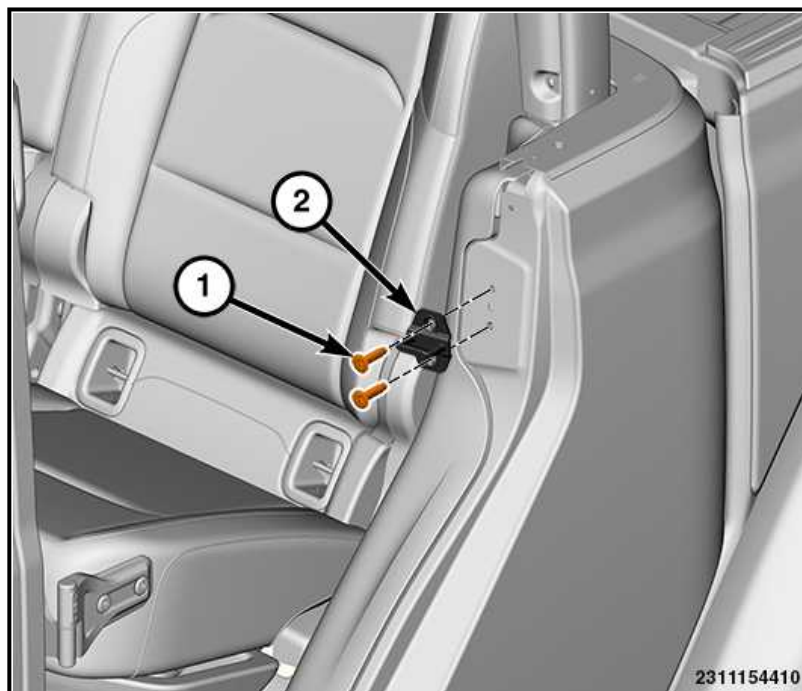
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

STRIKER, DOOR LATCH

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

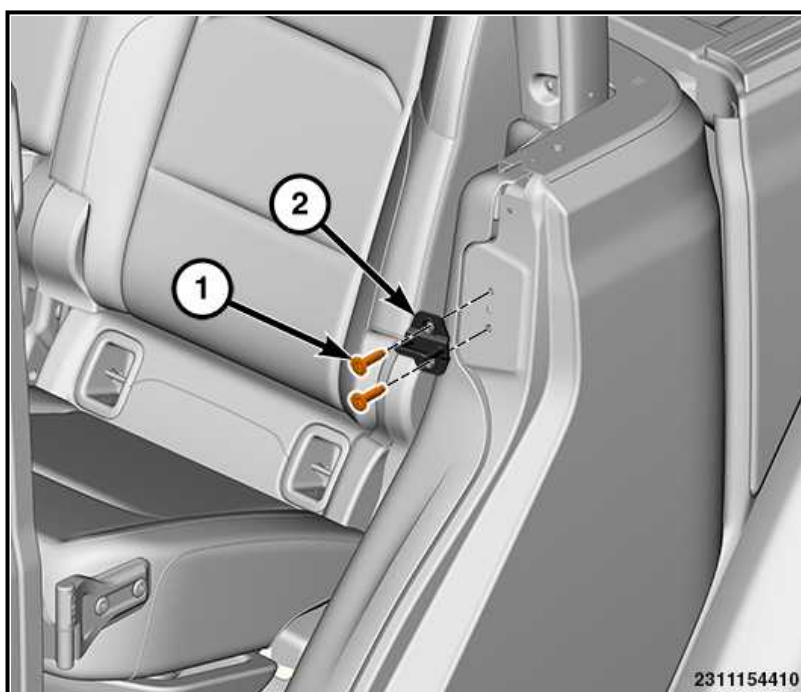


NOTE: The front door and rear door latch strikers are removed the same way.

REMOVAL

1. Using a grease pencil or equivalent, mark the position of the door latch striker (2) to aid installation.
2. Remove the bolts (1) and the door latch striker (2).

NOTE: If any shims are used between the door latch striker and body, reuse them during installation.



INSTALLATION

1. Position the door latch striker (2) onto the vehicle and loosely install the bolts (1).

2. Align the door latch striker with the reference mark made previously and tighten the door latch striker bolts to the proper Refer to **TORQUE SPECIFICATIONS** .
 3. Verify door fit and operation. Adjust the door latch striker if necessary Refer to **GAP AND FLUSH, SPECIFICATIONS**.
-

2021 ACCESSORIES AND BODY, CAB

Body - Interior & Exterior (2 Of 2) - Gladiator

EXTERIOR

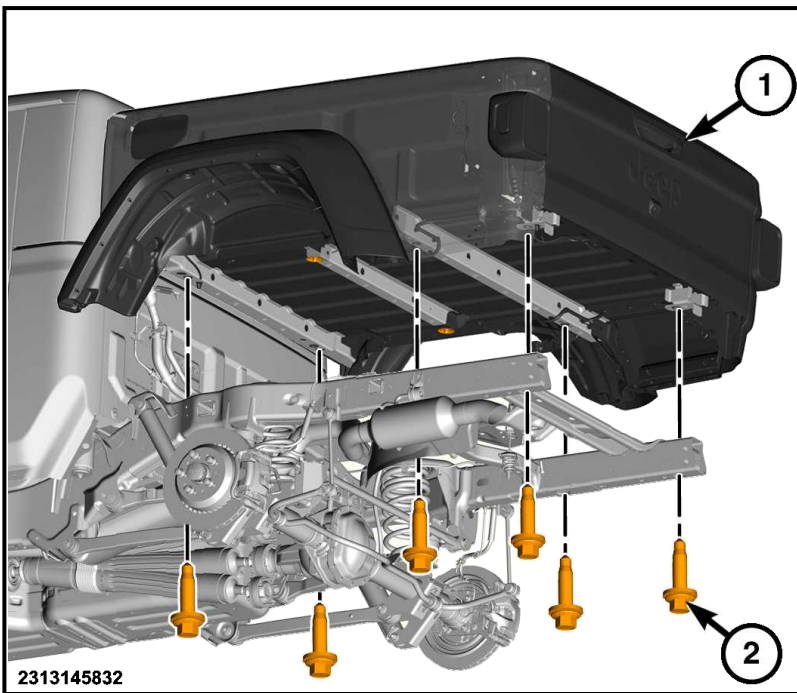
BOX, PICKUP

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Disconnect the fuel filler neck from the fuel tank (Refer to the appropriate service information).
3. Disconnect the tail lamp wire harness from the underbody wire harness.
4. If necessary, remove the tail lamp units and wire harness from the cargo box. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
5. If necessary, remove the tailgate. Refer to [TAILGATE, REMOVAL AND INSTALLATION](#) .
6. If necessary, remove the rear bumper. Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#) .



7. Using an induction heating type tool, or equivalent, heat up each bolt (2) to soften the thread locking compound on the bolt threads.

CAUTION: DO NOT use power tools to remove or install the fastener(s). If power tools are used, damage to the vehicle or components may occur.

8. Remove and discard the bolts (2) that secure the cargo box (1) to the frame and remove the cargo box.

INSTALLATION

1. Position the cargo box onto the frame and loosely install the bolts.
2. Align the cargo box to the cab and tighten the bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

3. If removed, install tail lamp units and wire harness to the cargo box. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
4. Connect the tail lamp wire harness to the underbody wire harness.
5. If removed, install the tailgate. Refer to [TAILGATE, REMOVAL AND INSTALLATION](#) .
6. If removed, install the rear bumper. Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#) .
7. Connect the fuel filler neck at the fuel tank (Refer to the appropriate service information).
8. Connect the negative battery cable(s). Refer to the appropriate service information .

CAB

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

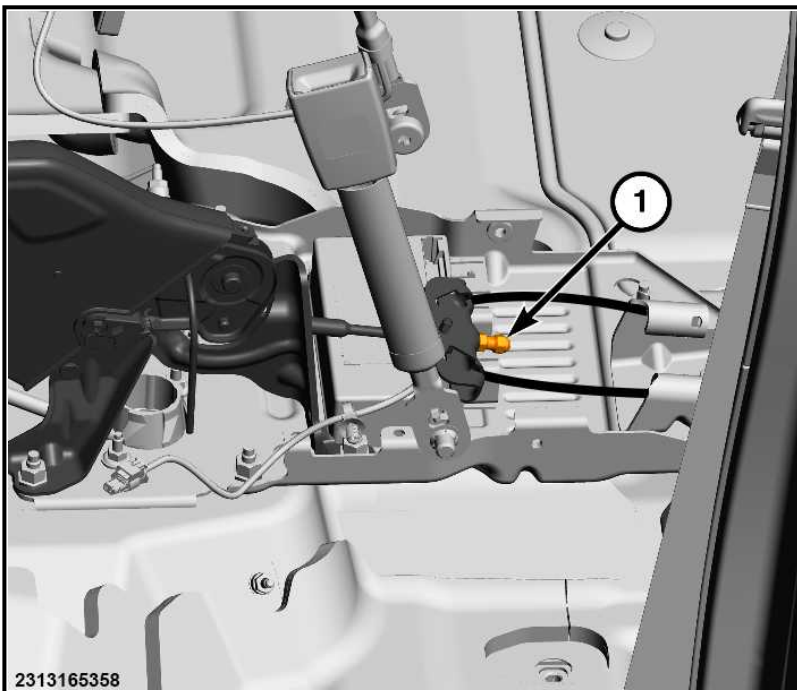
This procedure for use with vehicles equipped with a 3.0L diesel engine.

REMOVAL

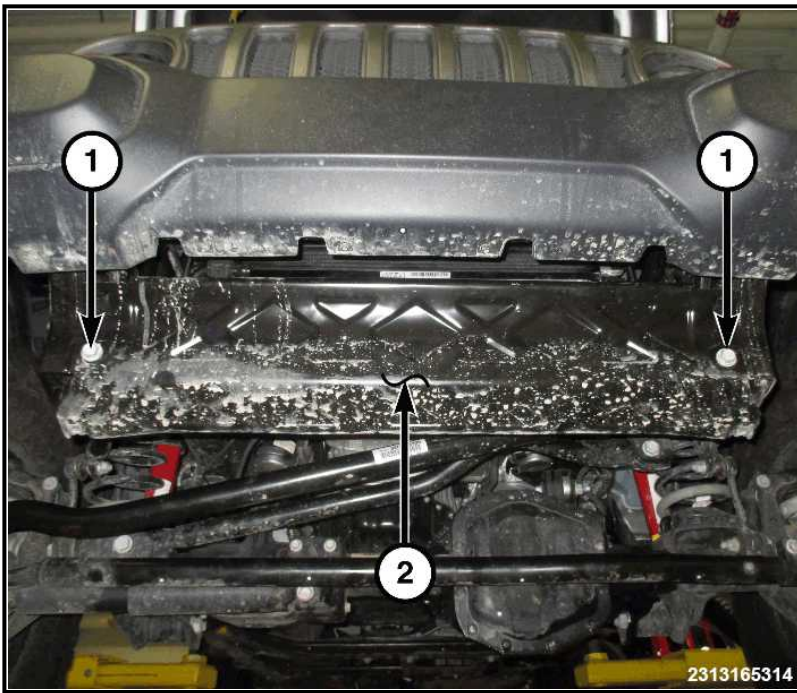
1. Secure the steering wheel with the tires in the **straight ahead position** .
2. Using a brake pedal holding tool, depress the brake pedal past its first 25 mm (1.0 in.) of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir while the lines are disconnected.
3. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
4. Recover the A/C refrigerant from the refrigerant system

Refer to [PLUMBING, STANDARD PROCEDURE](#) .

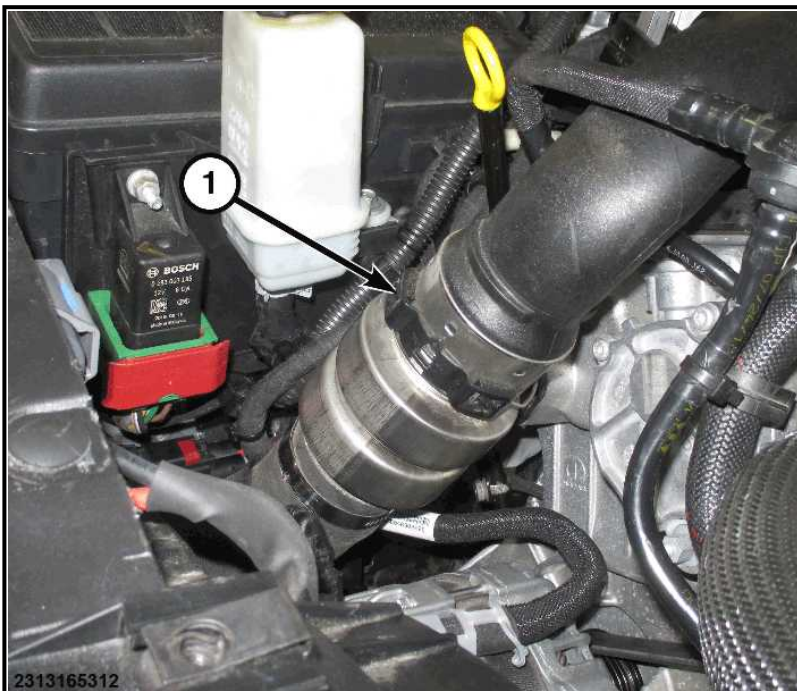
5. Remove the coolant reservoir (Refer to the appropriate service information).
6. Remove the floor console. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) .



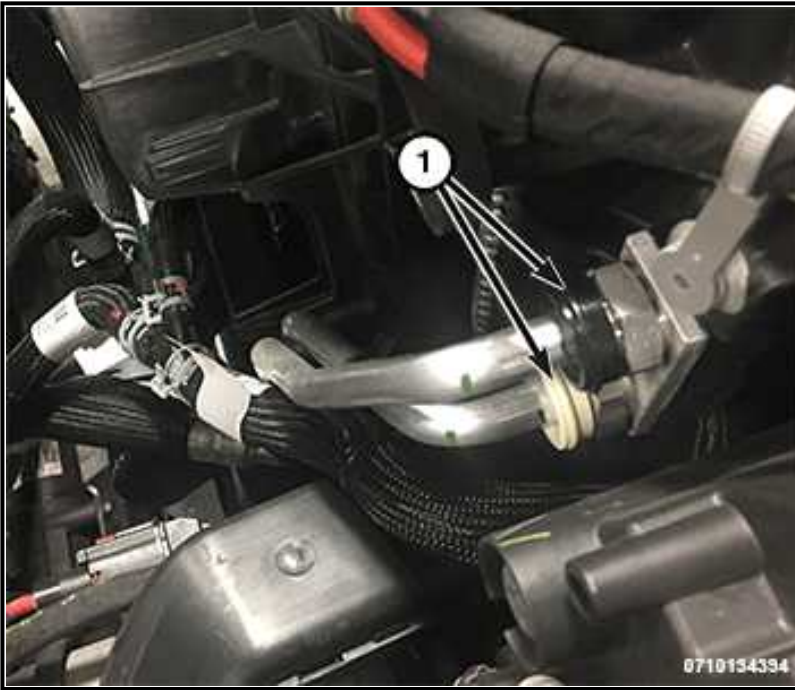
7. Loosen the park brake cable adjustment nut (1) to attain slack in the cable in order to disconnect at the wheels.
8. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .
9. Remove the front wheelhouse splash shields. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) .
10. Remove the air dam. Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION](#) .



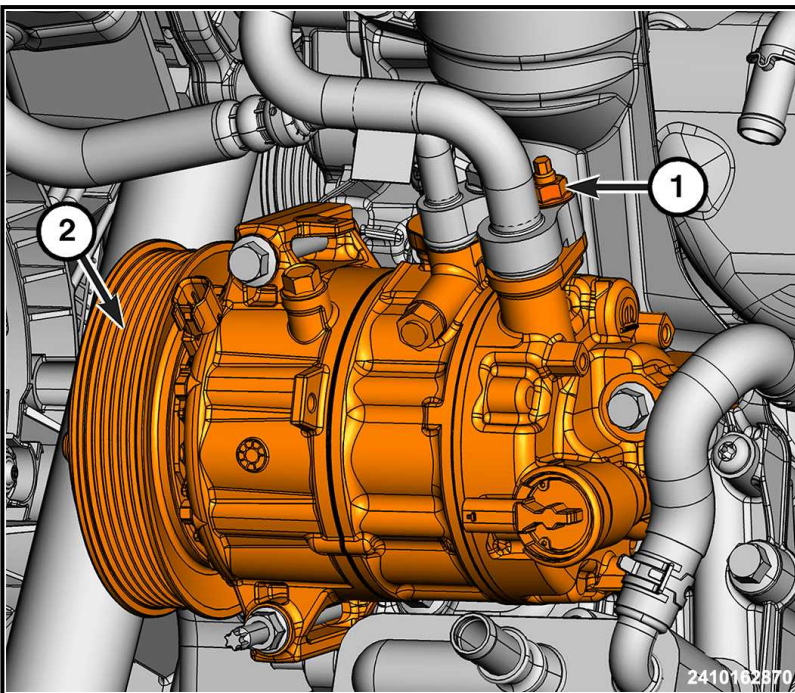
11. Remove the bolts (1) and remove the front skid plate (2).
12. Remove the charge air cooler left hose. Refer to [COOLER AND HOSES, CHARGE AIR, REMOVAL AND INSTALLATION](#) .
13. Remove the air intake assembly and hose. Refer to [BODY, AIR CLEANER, REMOVAL AND INSTALLATION](#) [BODY, AIR CLEANER, REMOVAL AND INSTALLATION](#) . Refer to [HOSE, CLEAN AIR, REMOVAL AND INSTALLATION](#) .



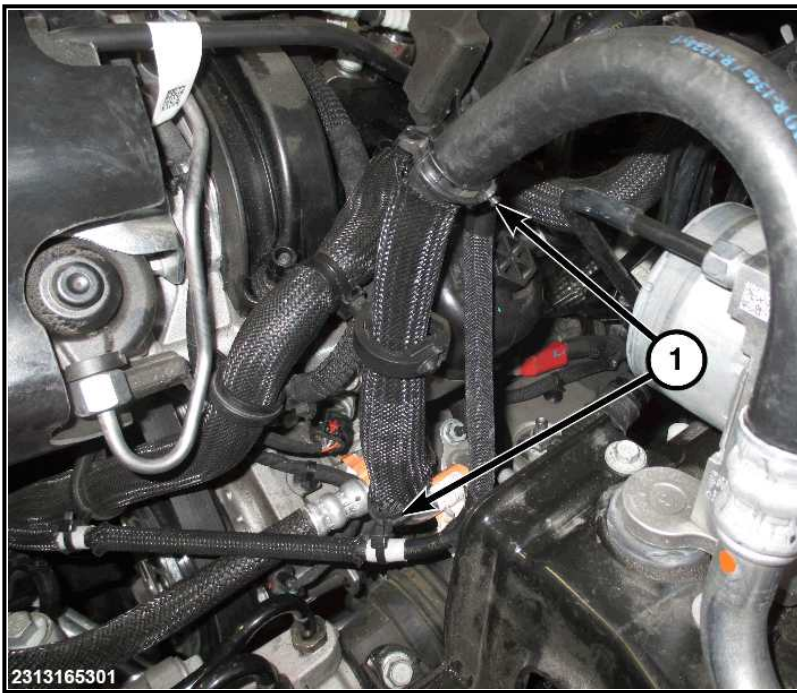
14. Disconnect the tube (1).
15. Remove the upper radiator hose from the radiator.



16. Disconnect the transmission fluid cooler tubes (1) from the transmission fluid cooler.
17. Remove the electric cooling fan (Refer to the appropriate service information).
18. Disconnect the lower radiator hose from the radiator.



19. Remove the A/C suction jumper line (1).
20. Remove the A/C discharge line.



21. Release the retainer(s) (1).

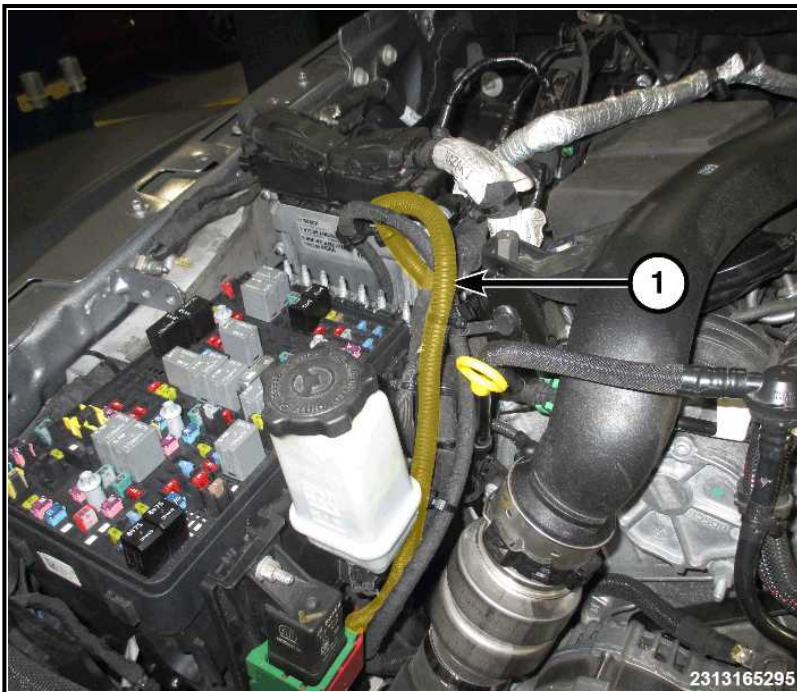
22. Install protective plugs, or tape over the opened refrigerant line fittings and compressor ports.



23. Disconnect the vacuum line (1) and release the retainers.



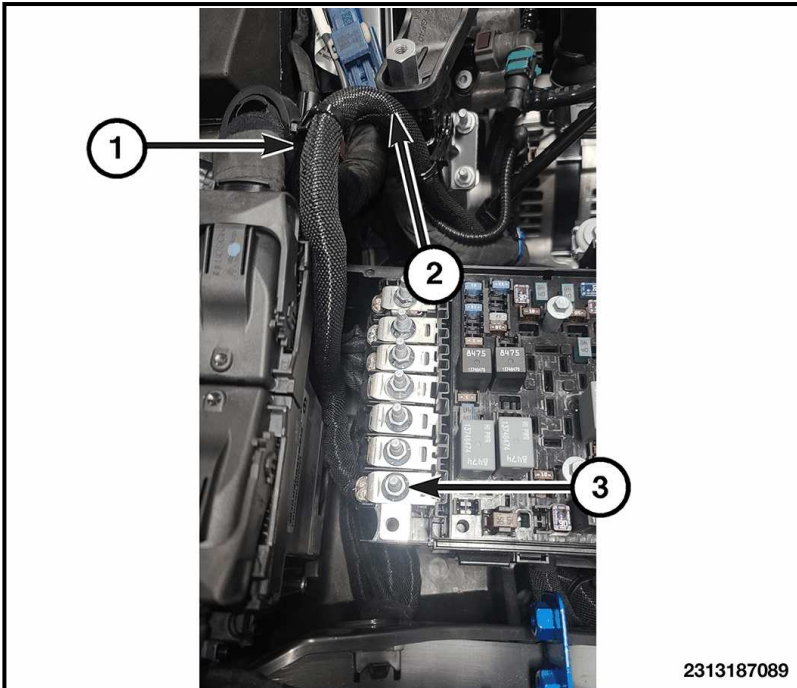
24. Remove the de-gas hose (1) from the engine and radiator.



25. Release the retainers and position aside the block heater wire harness (1).

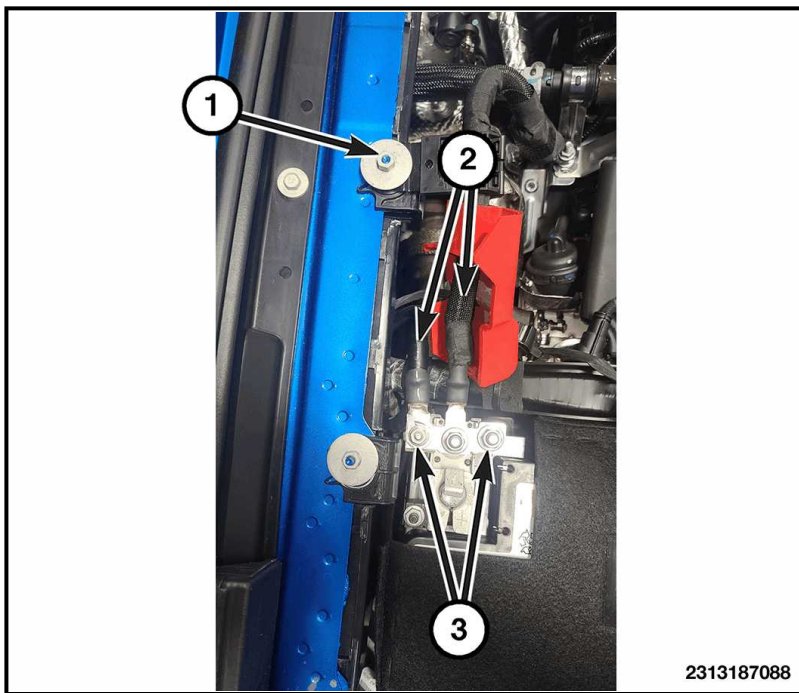


26. Disconnect the Powertrain Control Module (PCM) wire harness connector (1) and release it from the wire harness retainers.

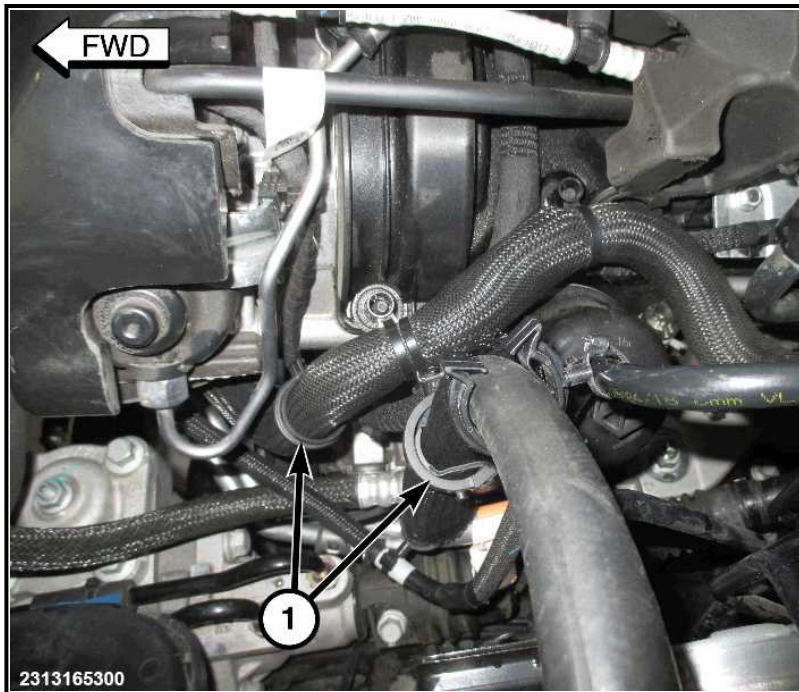


27. Remove the nut (3).

28. Release the retainers (1) and position the cable (2) aside.



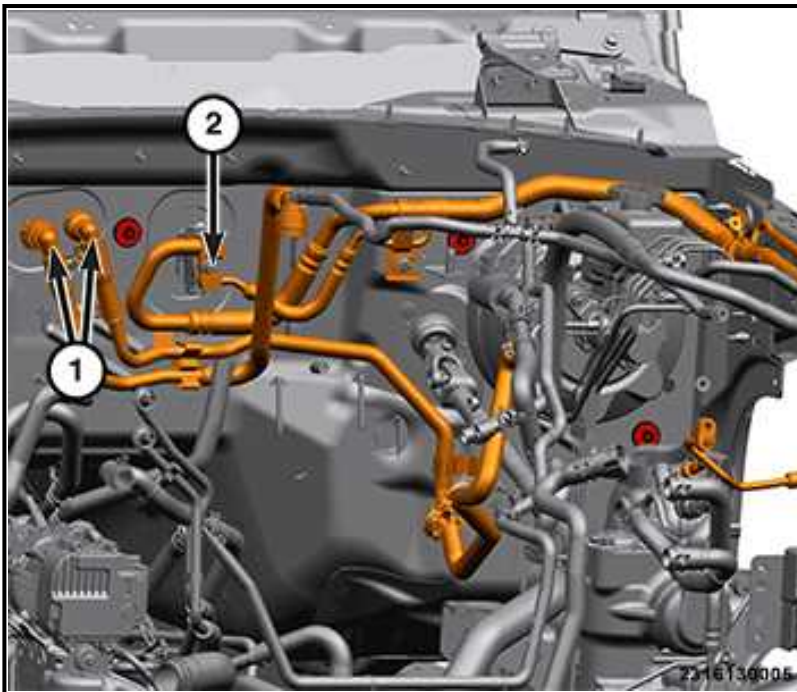
29. Remove the nuts (1 and 3) the position the cables (2) aside.



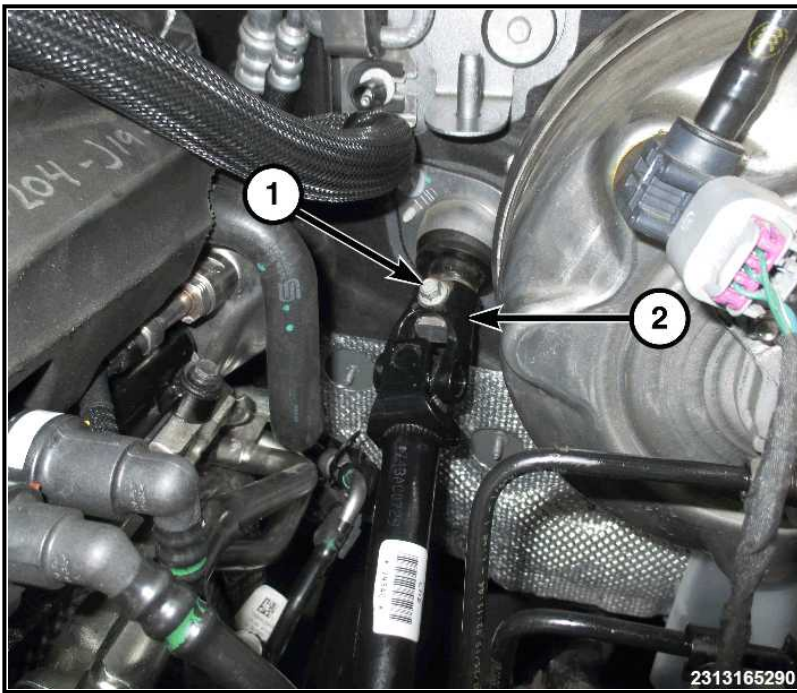
30. Release the retainer(s) (1).



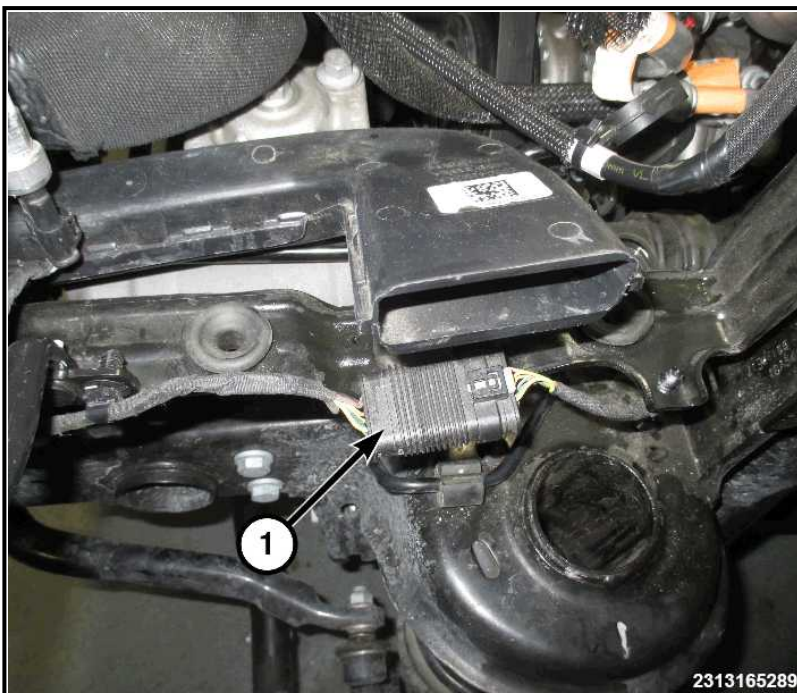
31. Disconnect the hose (1).



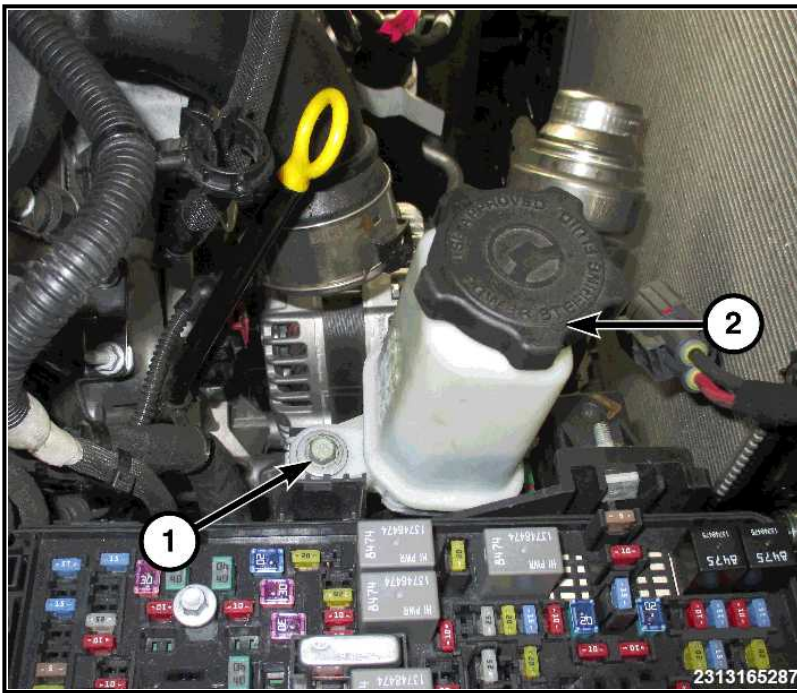
32. Disconnect the passenger side heater core hose (1).



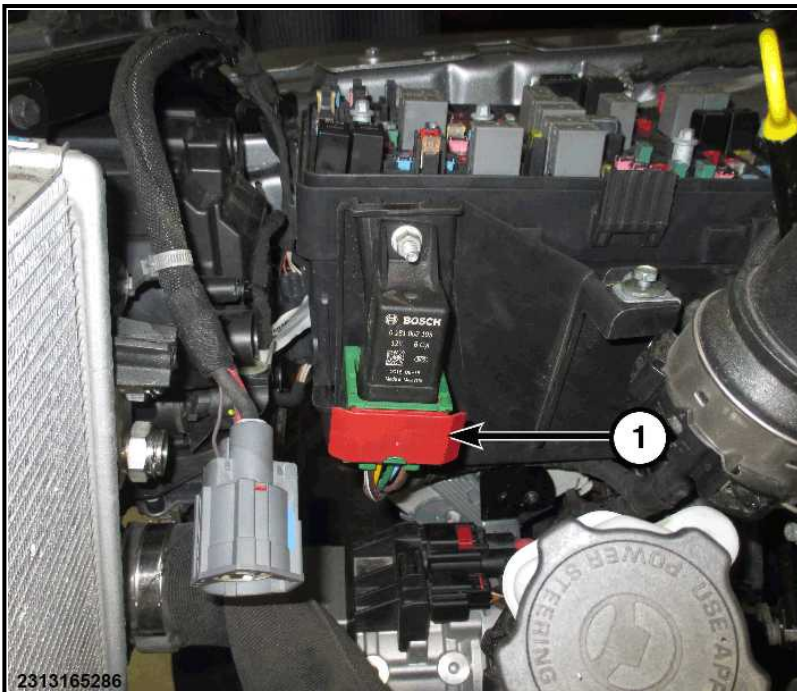
33. Remove and **DISCARD** the intermediate shaft coupler upper pinch bolt (1) from the steering column end of the steering shaft.
34. Slide the intermediate shaft coupler (2) off of the steering column.



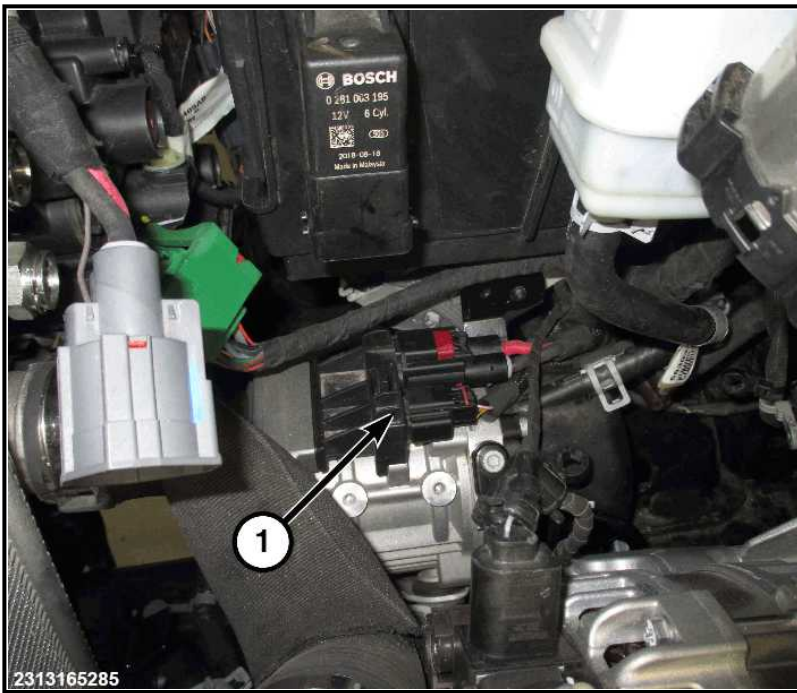
35. Disconnect the wire harness connector (1) located under the air cleaner assembly.



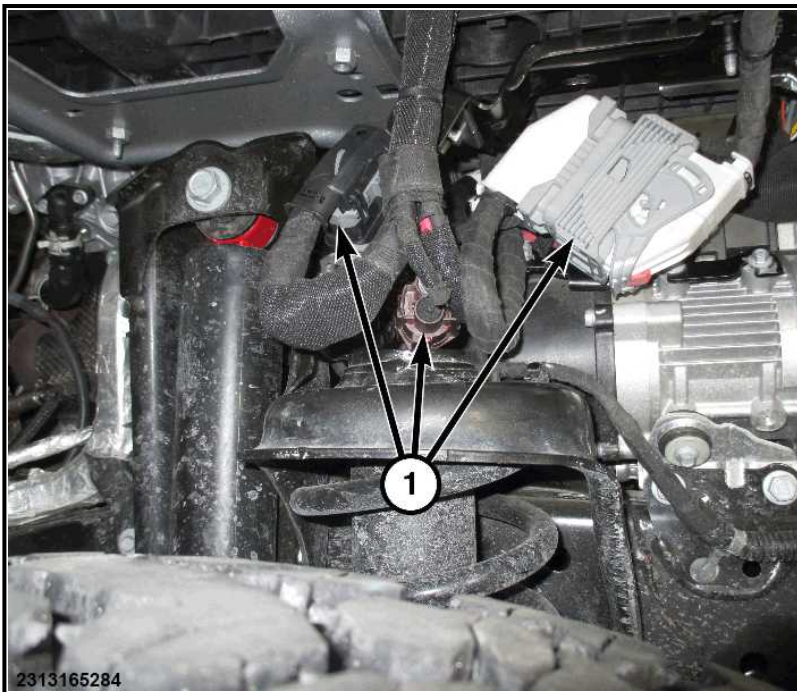
36. Remove the bolt (1) and position the power steering fluid reservoir (2) aside.



37. Disconnect the wire harness connector (1).



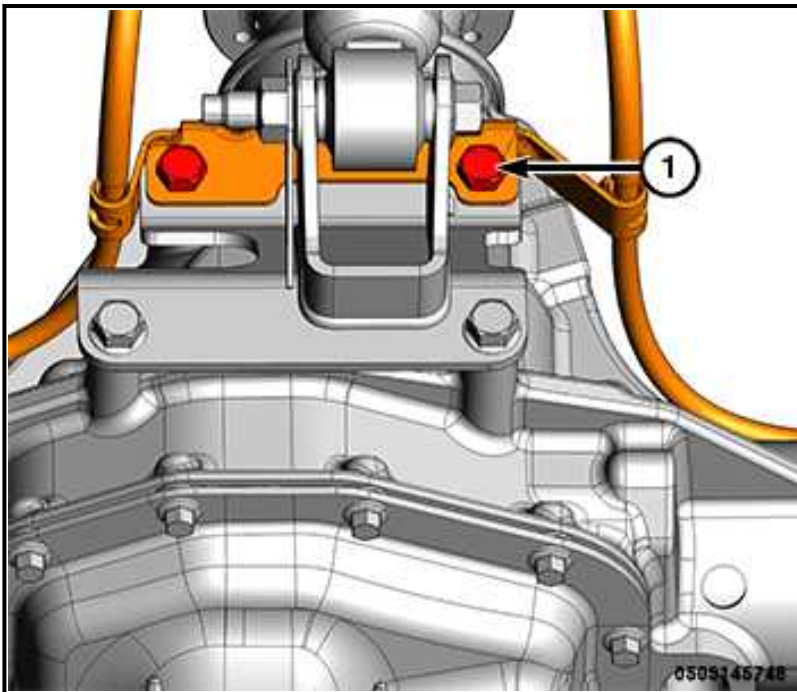
38. Disconnect the power steering wire harness connectors (1) and release all harness retainers.



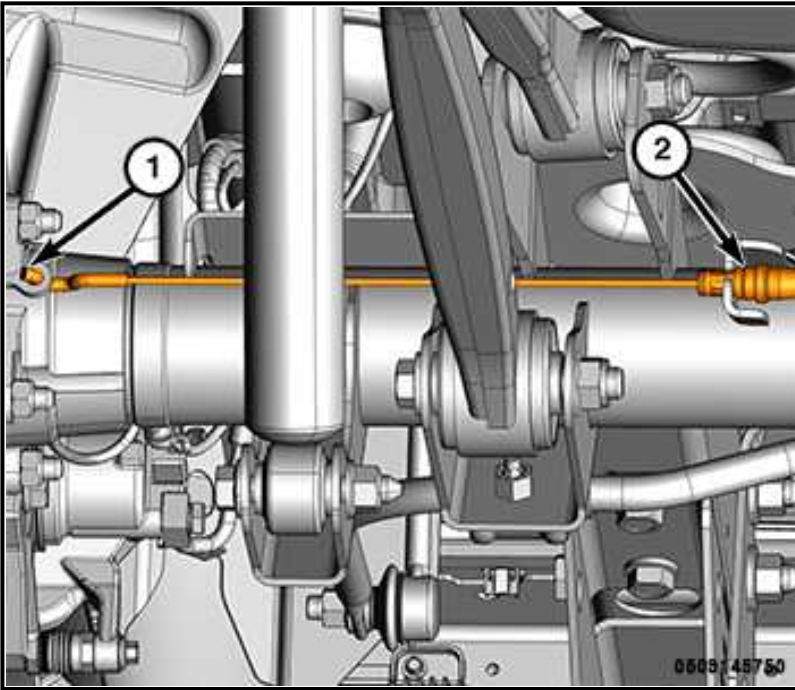
39. Disconnect the wire harness connectors (1) at the front and rear of the right front wheel house.



45. Separate the park brake cables (1) from the support bracket.



46. Remove park brake cable bracket bolts (1).



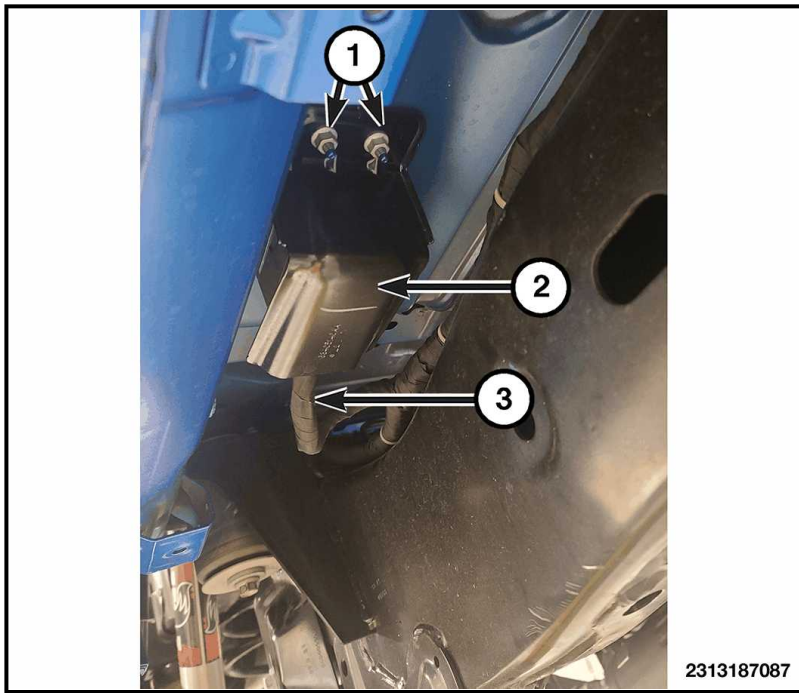
47. Remove the brake cable end (1) from the brake actuator.

48. Depress the park brake cable tabs and remove the cable (2) from the axle bracket.



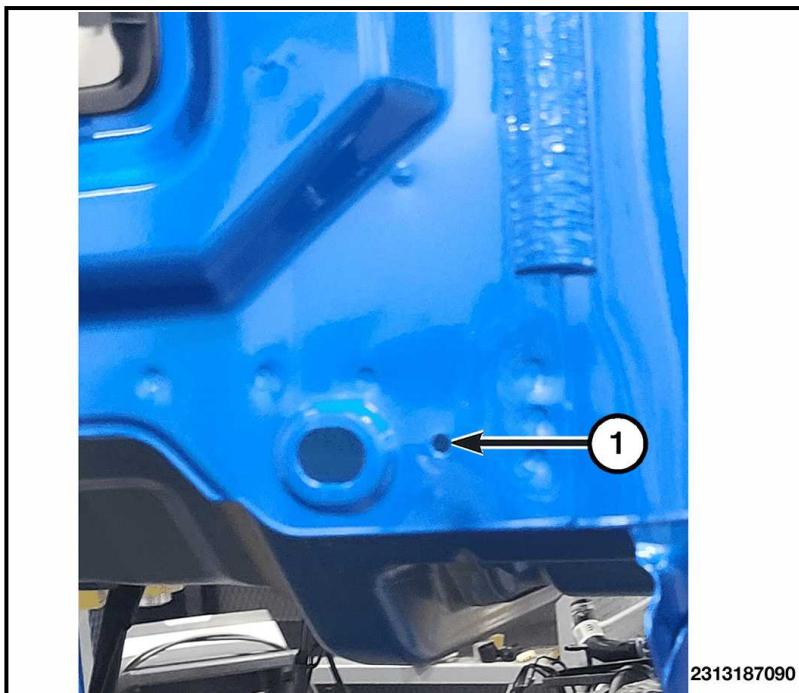
49. Pull the park brake cable (1) through the routing bracket and remove the park brake cable (1).

50. If equipped, remove the side steps or rock guards. Refer to **STEP, SIDE, REMOVAL AND INSTALLATION**.



51. Remove the nuts (1) and cover (2).

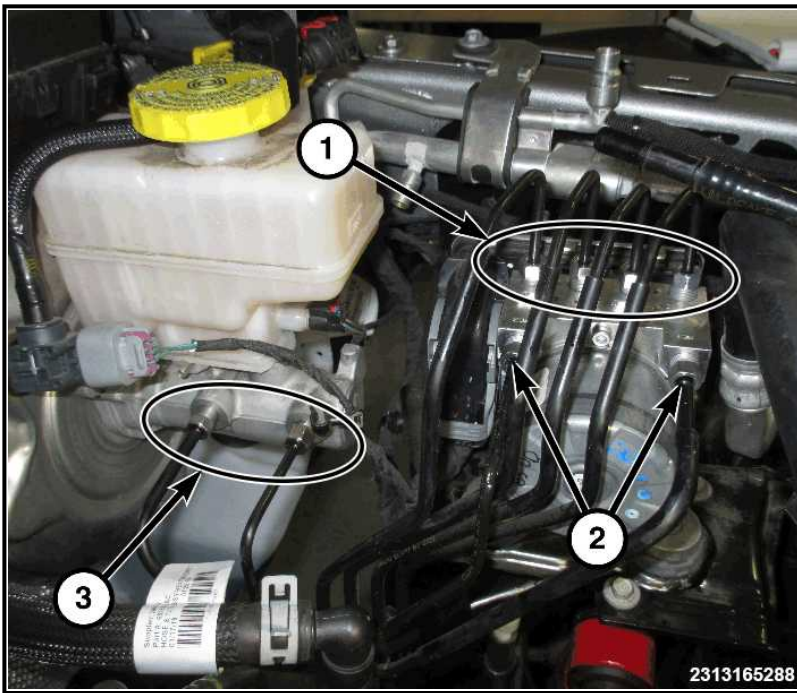
52. Disconnect the wire harness connectors (3) under the left and right side of the cab.



53. Release the wire harness retainer on the right side of the cab (1).

54. Remove all the body isolator fasteners. Refer to [ISOLATOR, BODY, REMOVAL AND INSTALLATION](#).

NOTE: It is not necessary to remove the isolators to lift the body off the chassis.



55. Disconnect the brake lines (1) from the Hydraulic Control Unit (HCU).

56. Lower the vehicle and reposition the hoist on the lower body flanges.

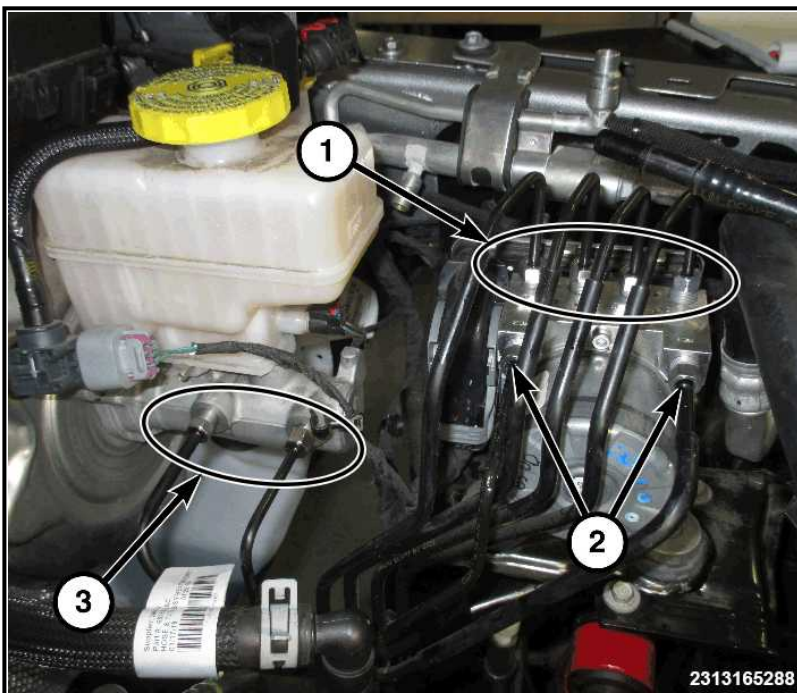
57. Carefully lift the body off of the chassis.

INSTALLATION

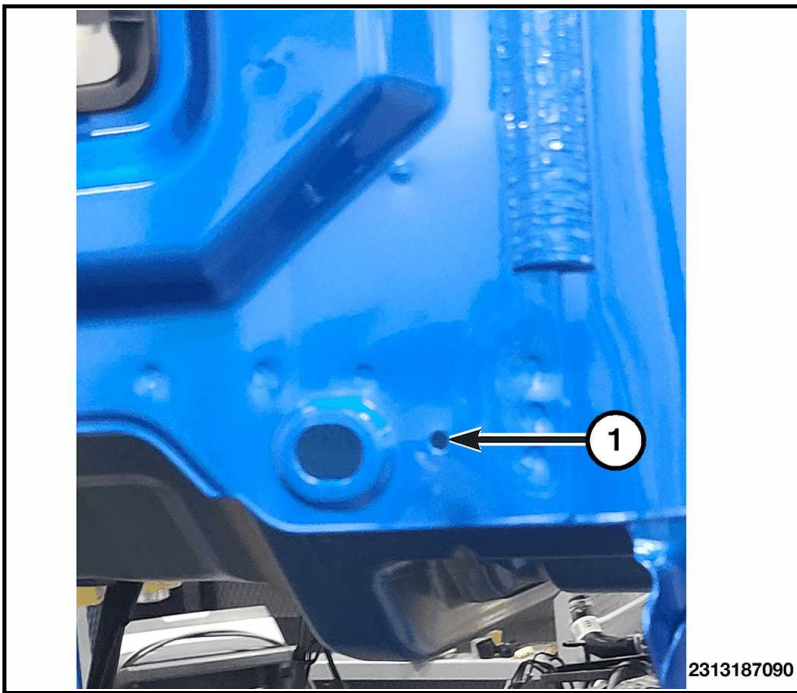
1. Using wheel lift jacks or equivalent, position the chassis under the body.

2. Lower the body onto the isolators.

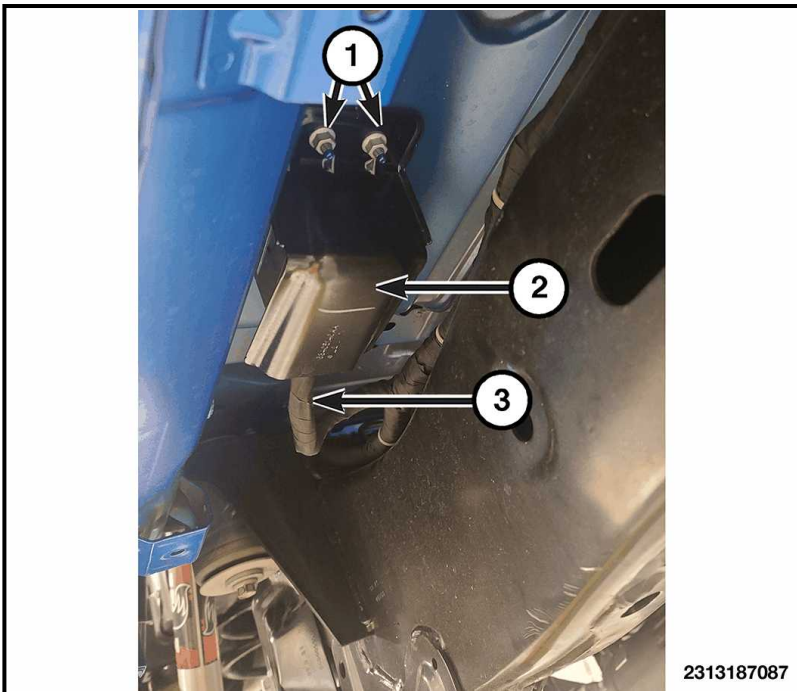
3. Install all of the body isolator fasteners. Refer to [ISOLATOR, BODY, REMOVAL AND INSTALLATION](#).



4. Connect the brake lines (1). Tighten the brake lines to the proper (Torque Specifications).



5. Install the wire harness retainer on the right side of the cab (1).

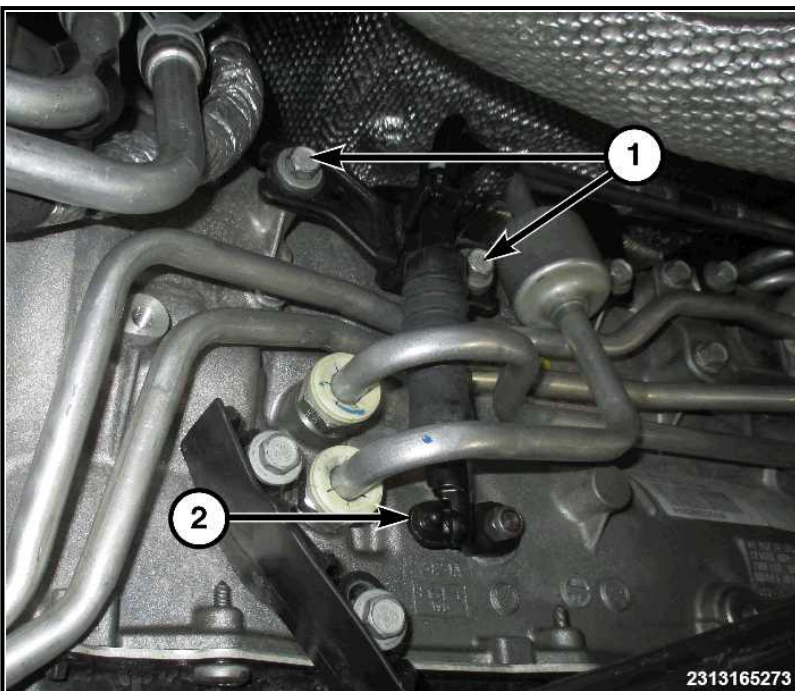


6. Connect the wire harness connectors (3) under the left and right side of the cab.
7. Install the cover and tighten the nuts securely.
8. If equipped, install the side steps or rock guards. Refer to [STEP, SIDE, REMOVAL AND INSTALLATION](#).
9. Install the park brake cables. Refer to [CABLE, PARKING BRAKE, REMOVAL AND INSTALLATION](#).



10. Install the park brake cables on the support bracket.

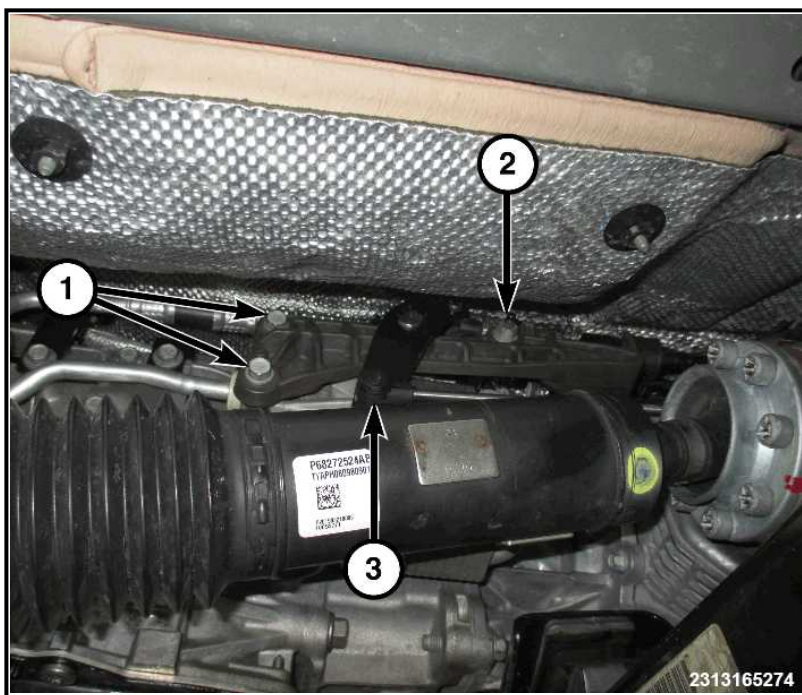
11. Install the cable retainers along the manual park release cable as needed.



12. Install the manual park release cable bracket to the transmission.

13. Install the manual park release cable bracket bolts (1) to the proper (Torque Specifications).

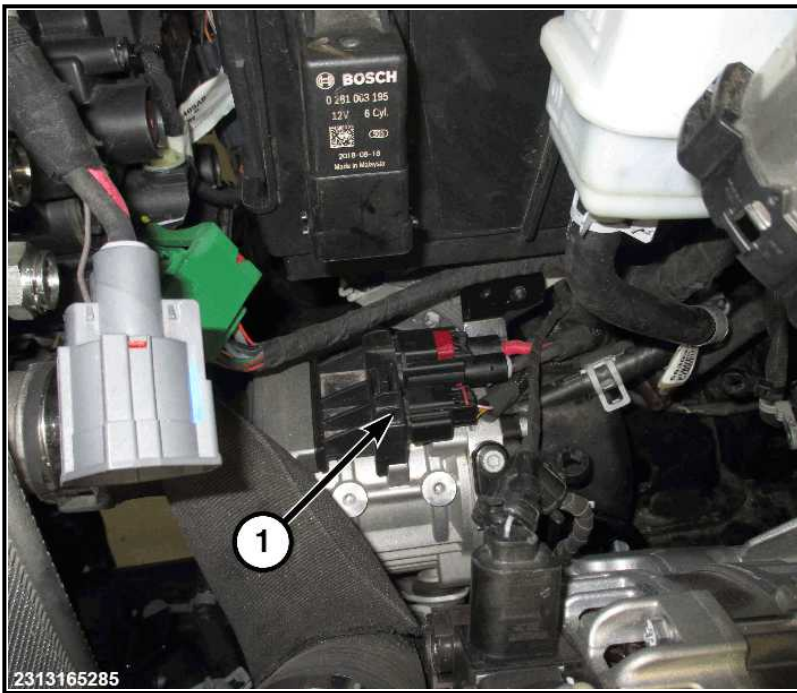
14. Install the cable retainers along the manual park release cable as needed.



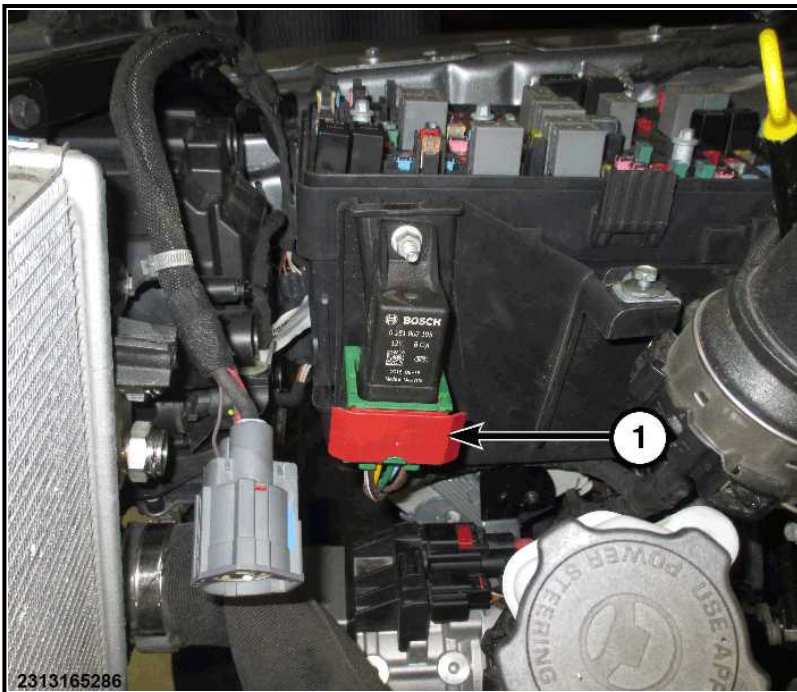
15. Install the shift shaft bracket bolts (1) and the nut (2). Tighten the shift shaft bracket bolts and the nut to the proper (Torque Specifications).
16. Connect the shift shaft (3) and install the bracket to the transmission.



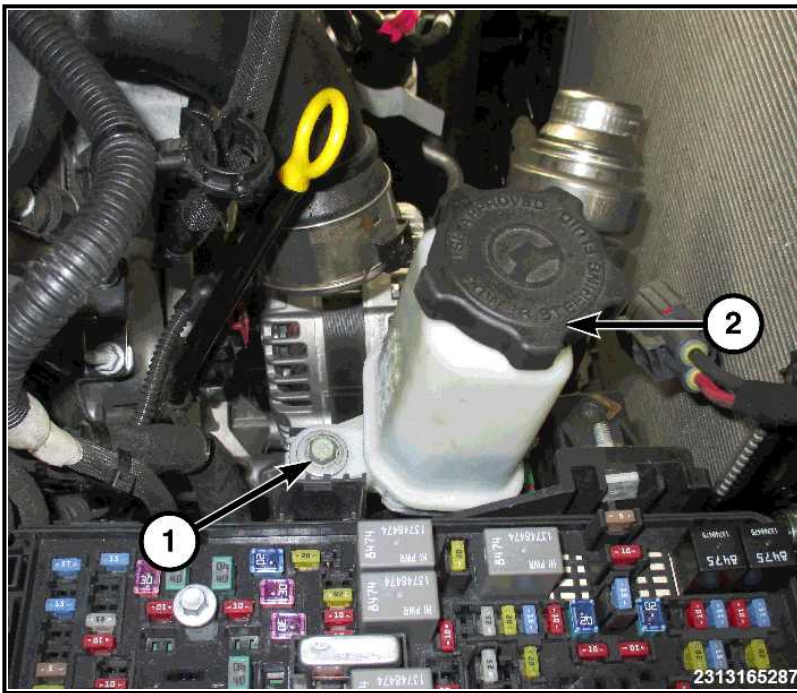
17. Connect the wire harness connectors (1) at the front and rear of the right front wheel house.



18. Connect the power steering wire harness connectors (1) and install all wire harness retainers.



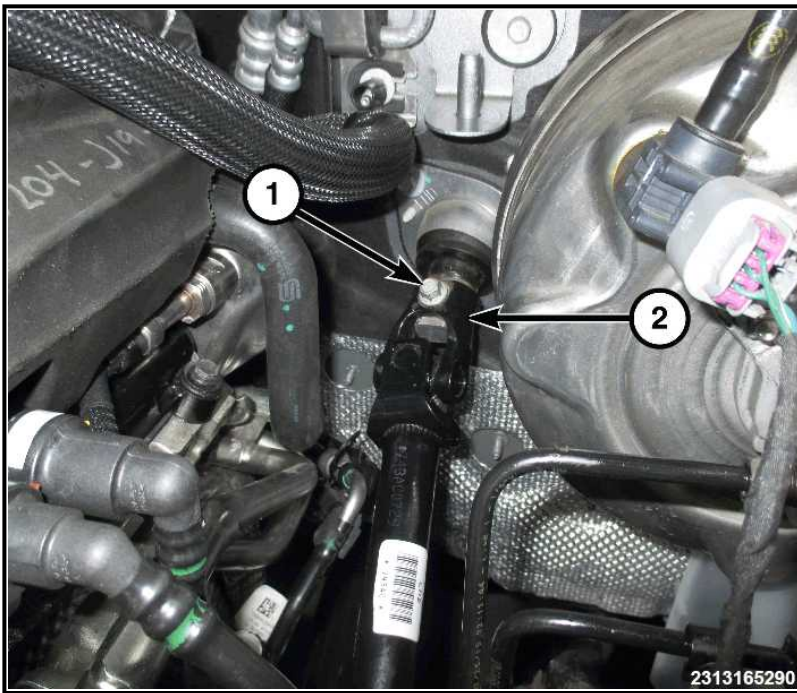
19. Connect the wire harness connector (1).



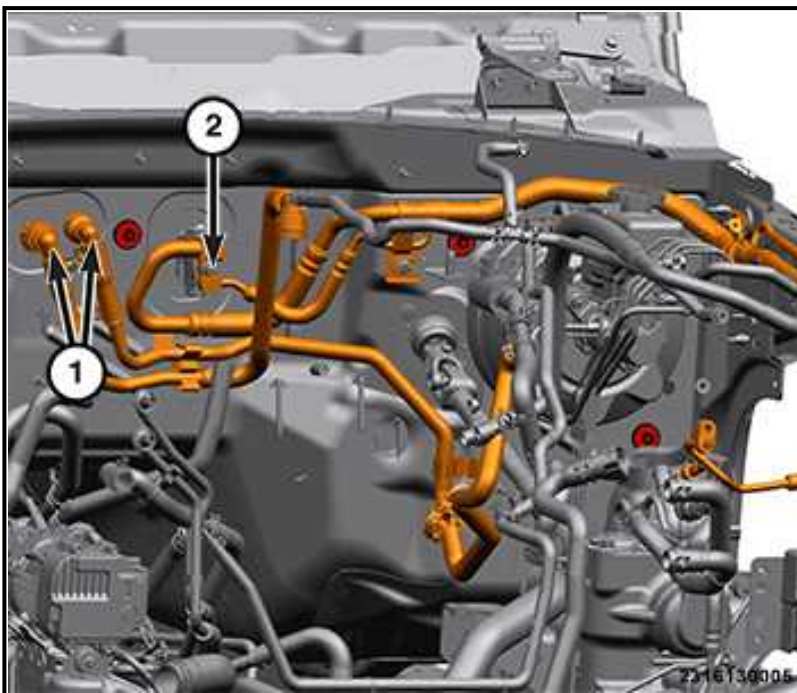
20. Install the power steering fluid reservoir (2) and tighten the power steering fluid reservoir bolt to the proper (Torque Specifications).



21. Connect the wire harness connector (1) located under the air cleaner assembly.



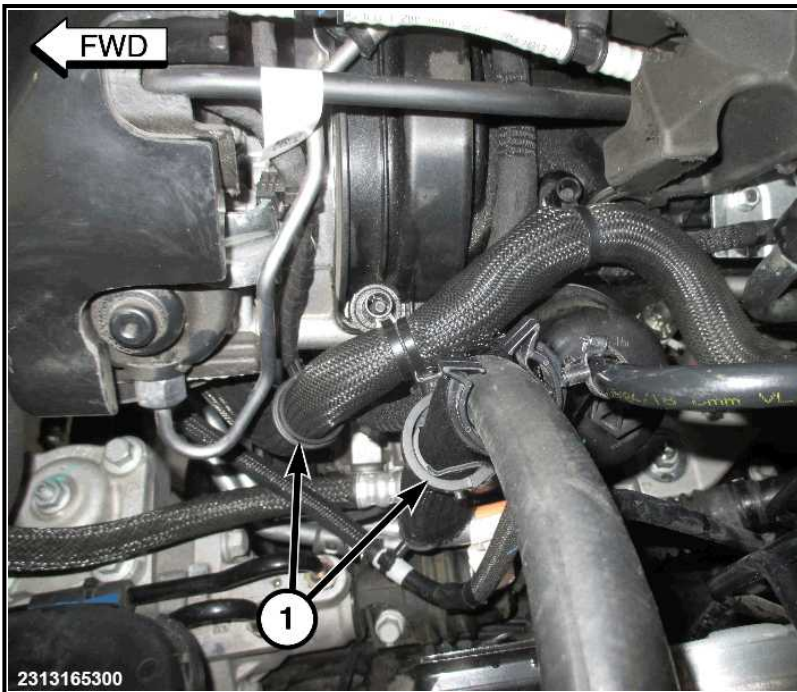
22. Install the intermediate shaft coupler (2) to the steering column.
23. Install a **NEW** intermediate shaft coupler upper pinch bolt (1) to the steering column end of the steering shaft. Tighten the intermediate shaft coupler upper pinch bolt to the proper (Torque Specifications).



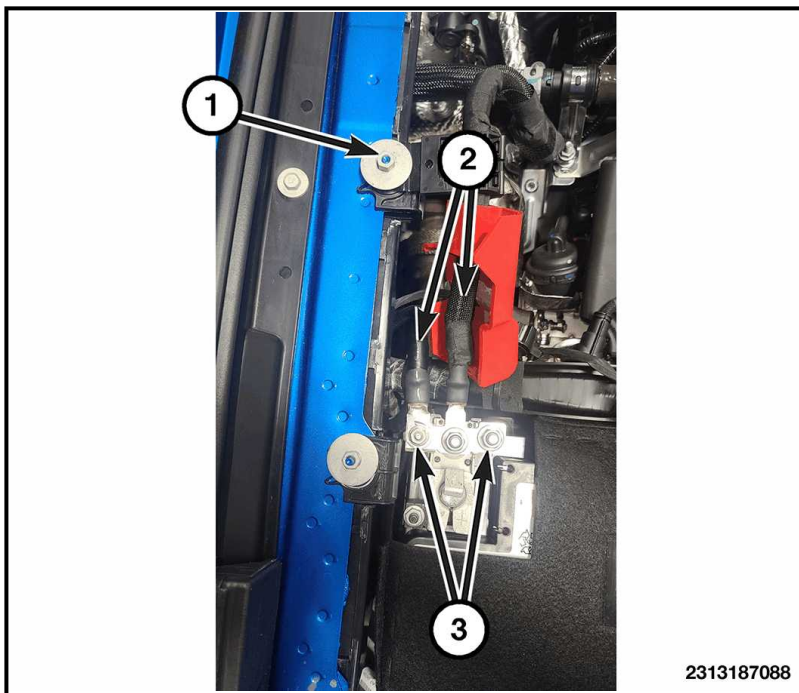
24. Connect the passenger side heater core hose (1).



25. Connect the hose (1).

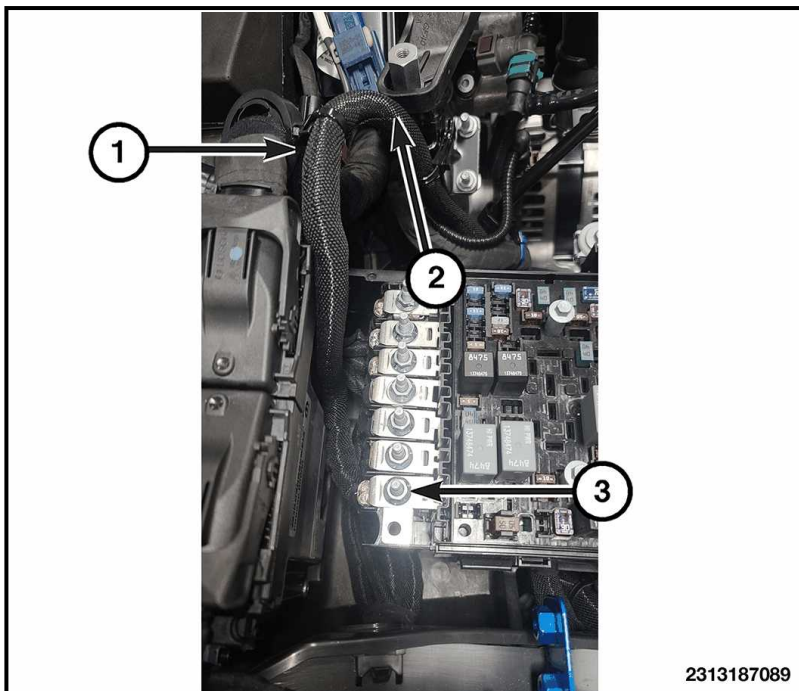


26. Install the retainer(s) (1).



27. Position the cables (2) back to their original location.

28. Install the nuts and tighten to the proper. Refer to the appropriate service information .

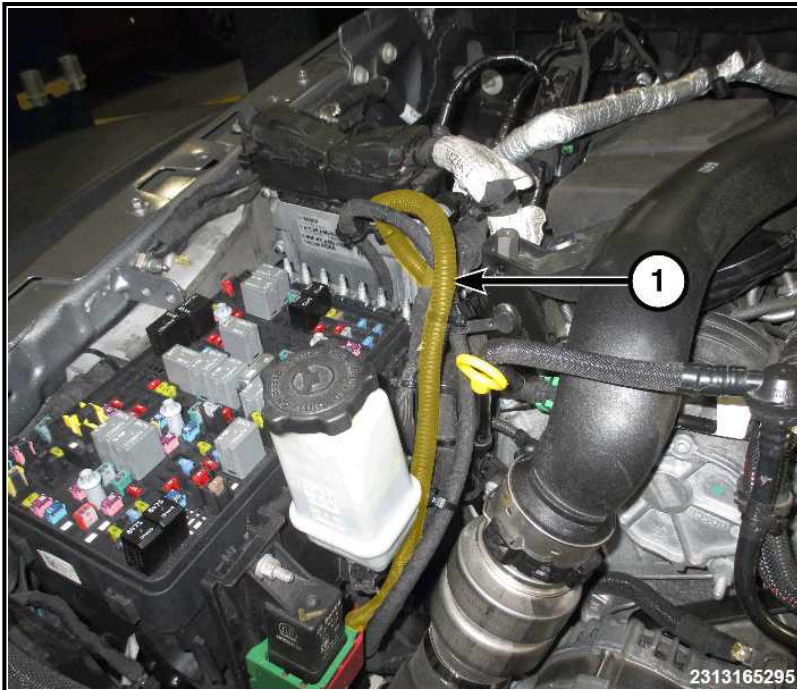


29. Install the cable (2) and retainers (1).

30. Install the nut and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



31. Connect the Powertrain Control Module (PCM) wire harness connector (1) and install the harness retainers.

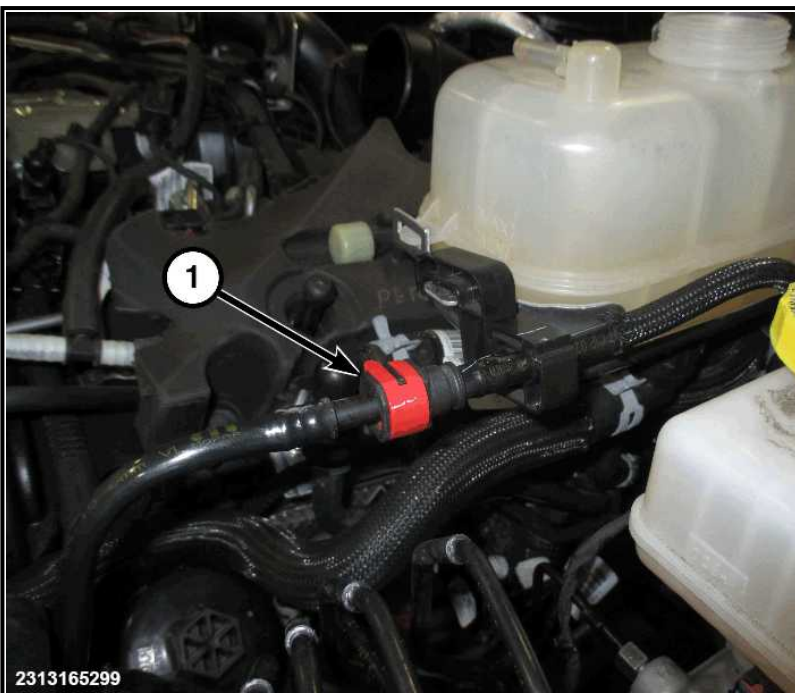


32. Install the retainers and the block heater wire harness (1).



33. Install the de-gas hose (1) to the engine and radiator.

34. Remove the protective plugs, or tape over the opened refrigerant line fittings and compressor ports.

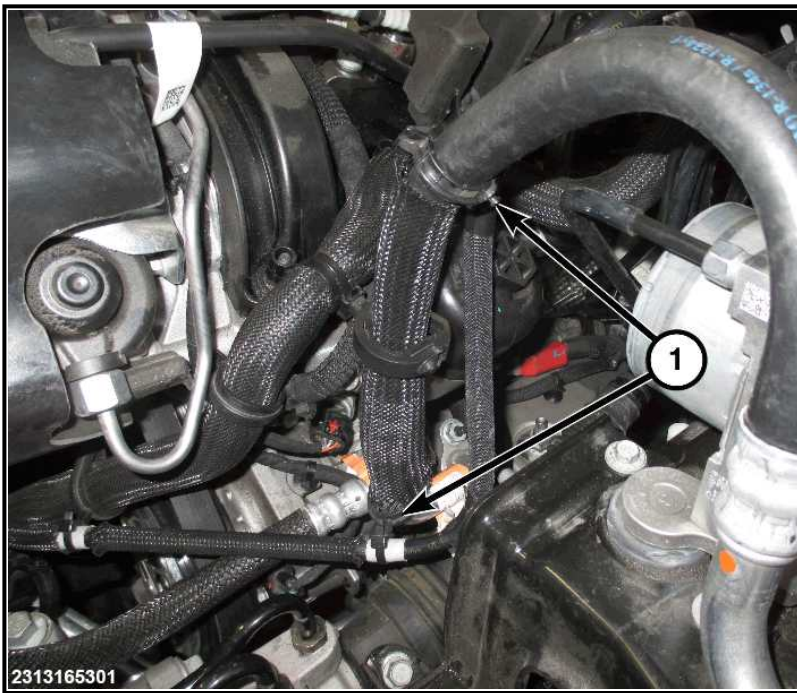


35. Connect the vacuum line (1) and install the retainers.

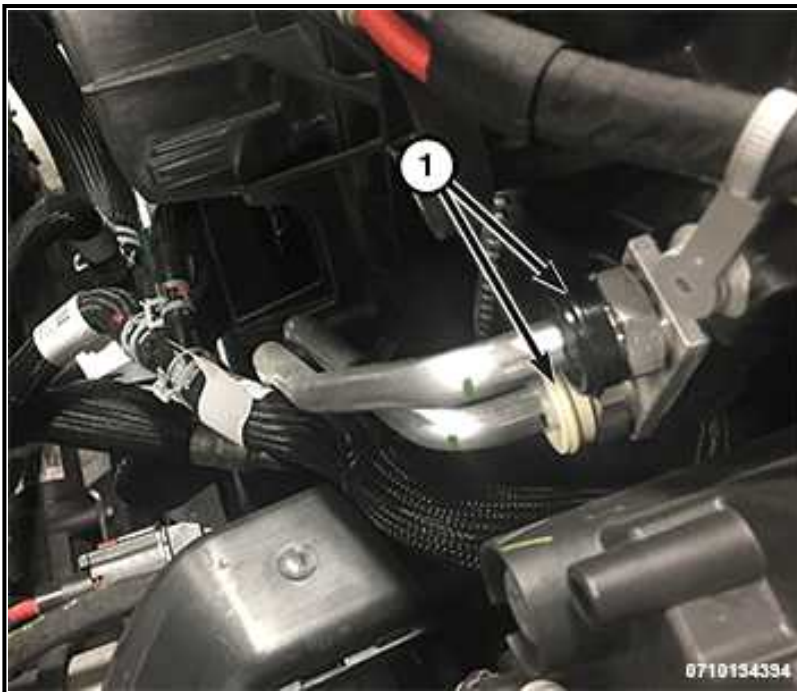
36. Install the A/C discharge line. Refer to [LINE, A/C DISCHARGE, REMOVAL AND INSTALLATION](#)

37. Install the A/C suction jumper line. Refer to [LINE, A/C SUCTION JUMPER, REMOVAL AND INSTALLATION](#) .

38. Connect the lower radiator hose at the radiator.



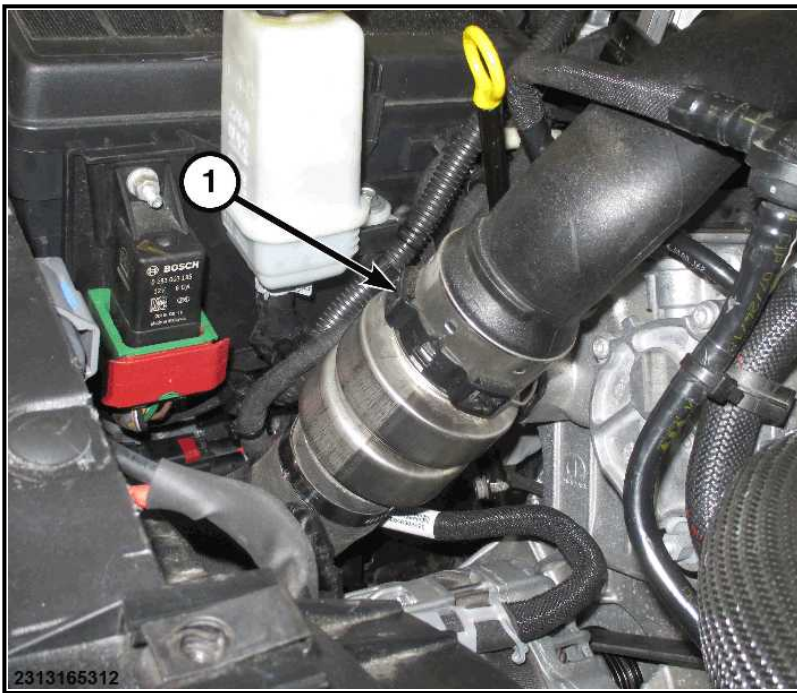
39. Install the retainer(s) (1).



40. Connect the transmission fluid cooler tubes (1).

41. Install the electric cooling fan (Refer to the appropriate service information).

42. Install the upper radiator hose at the radiator.



43. Connect the tube (1).
44. Install the air intake assembly, and hose. Refer to [BODY, AIR CLEANER, REMOVAL AND INSTALLATION](#) [BODY, AIR CLEANER, REMOVAL AND INSTALLATION](#) . Refer to [HOSE, CLEAN AIR, REMOVAL AND INSTALLATION](#) .
45. Install the charge air cooler left hose. Refer to [COOLER AND HOSES, CHARGE AIR, REMOVAL AND INSTALLATION](#) .



46. Install the front skid plate (2) and the bolts (1). Tighten the front skid plate bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
47. Install the air dam. Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION](#) .
48. Install the front wheelhouse splash shields. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) .
49. Perform the park brake adjustment procedure. Refer to [STANDARD PROCEDURE](#) .
50. Install the floor console. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) .
51. Install the coolant reservoir (Refer to the appropriate service information).
52. Charge the A/C refrigerant system. Refer to [PLUMBING, STANDARD PROCEDURE](#) .

53. Bleed the brake system. Refer to [STANDARD PROCEDURE](#) .
54. Connect the negative battery cable(s). Refer to the appropriate service information .

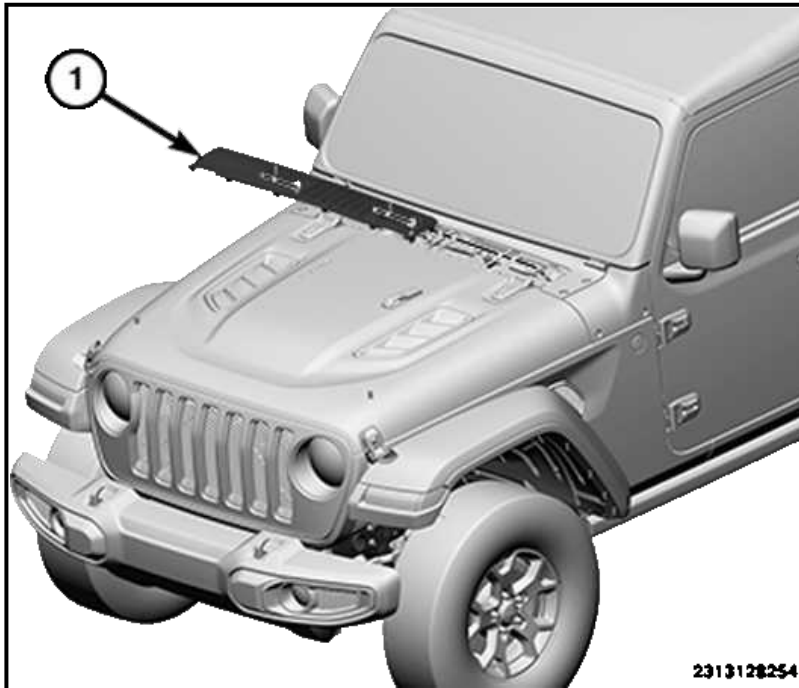
COVER, COWL PANEL

REMOVAL AND INSTALLATION

UPPER COWL PANEL

REMOVAL

1. Remove the wiper arms. Refer to [ARM, WIPER, REMOVAL AND INSTALLATION](#) .



1 - Upper Trim Cover

2. Using a (special tool #C-4755, Trim Stick) or equivalent, release the retaining clips and remove the upper trim cover.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.

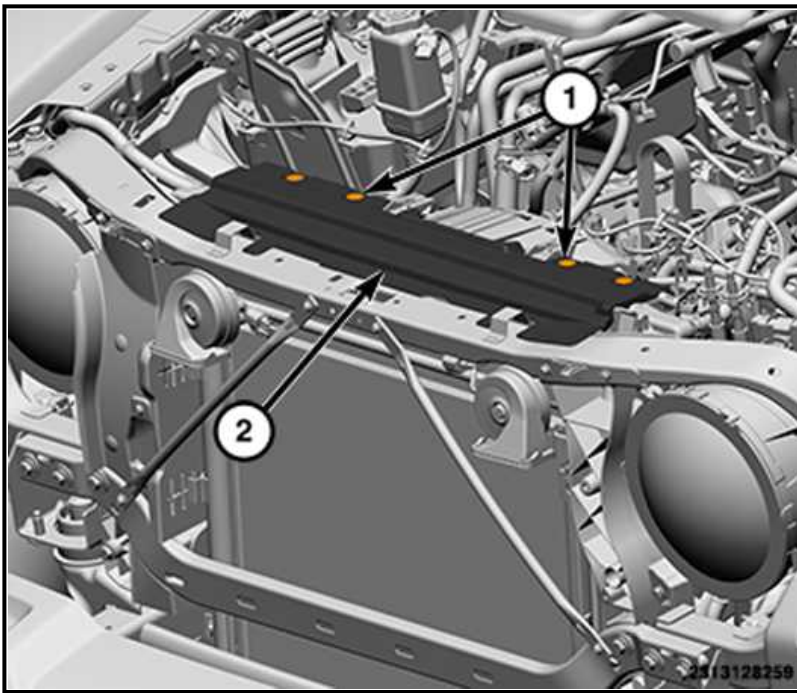
CROSSMEMBER, RADIATOR, UPPER

REMOVAL AND INSTALLATION

BASE

REMOVAL

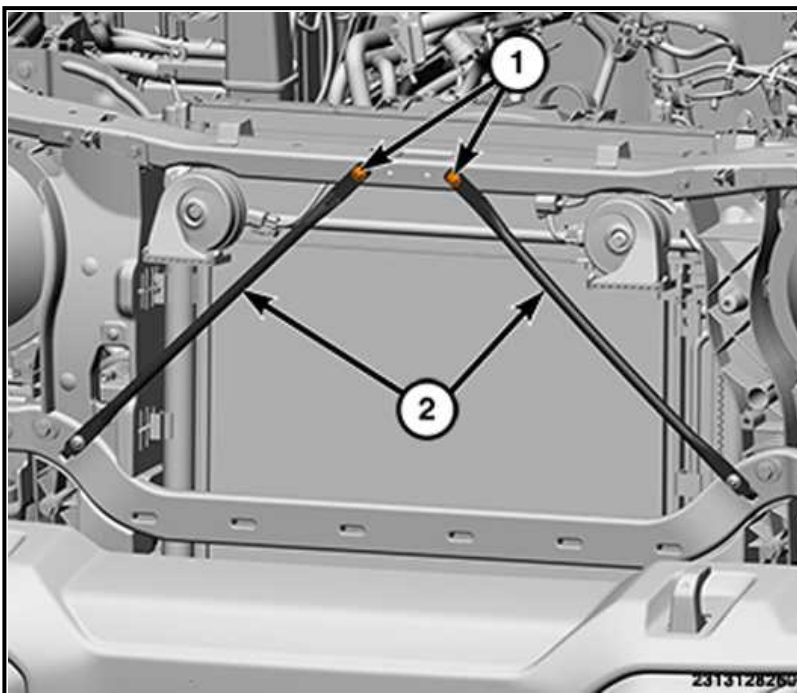
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the grille. Refer to [GRILLE, REMOVAL AND INSTALLATION](#).



1 - Fasteners

2 - Closeout Panel

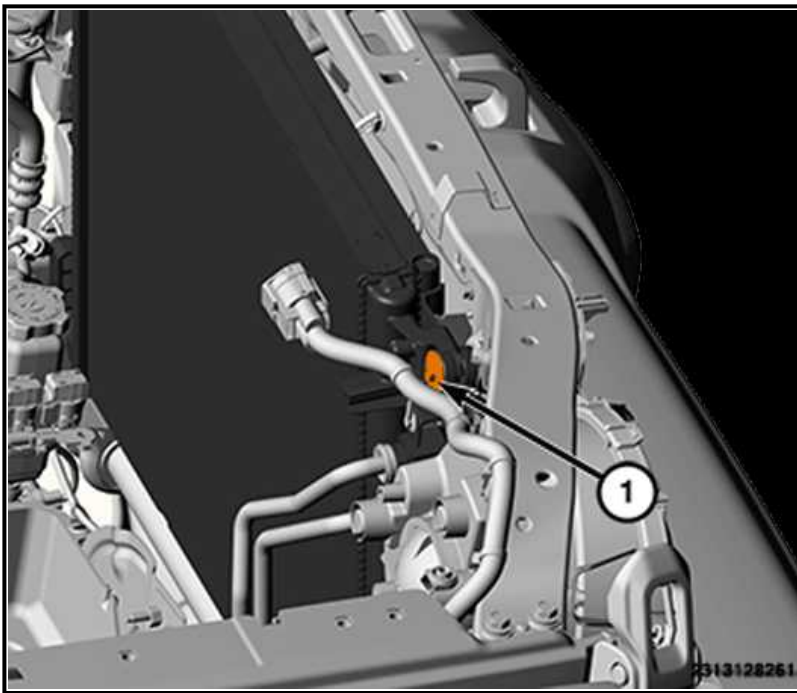
3. Remove the push pin fasteners and remove the closeout panel.



1 - Bolts

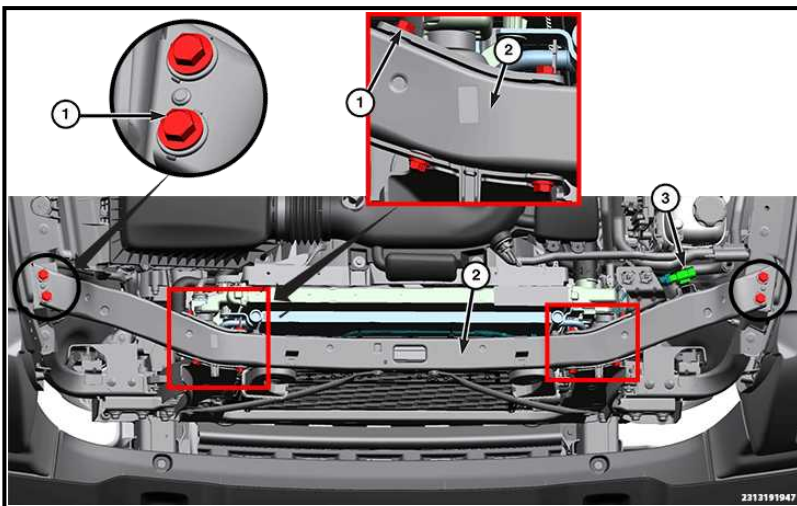
2 - Braces

4. Remove the bolts and separate the braces.



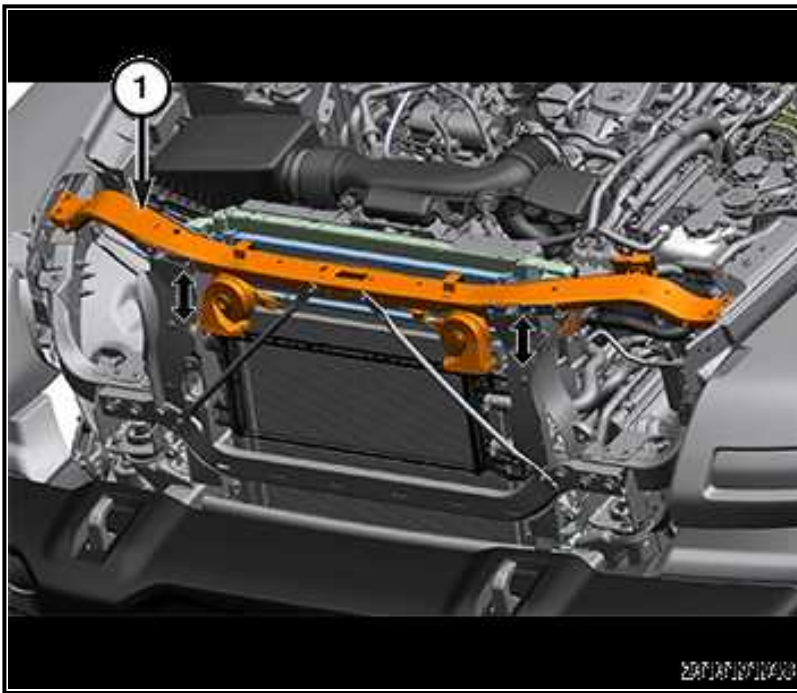
1 - Upper Radiator Mount Bolts

5. Remove the upper radiator mount bolts and separate the radiator from the upper crossmember.



1 - Bolts
2 - Upper Crossmember
3 - Wire Harness Connector

6. Disconnect the wire harness connector.
7. Remove the bolts from upper crossmember.



2 - Upper Crossmember

8. Remove the upper crossmember.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

TORQUE SPECIFICATIONS

- Install the side and front bolts then tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the upper radiator mount bolts and tighten to the proper. Refer to the appropriate service information .
- Install and tighten the braces bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

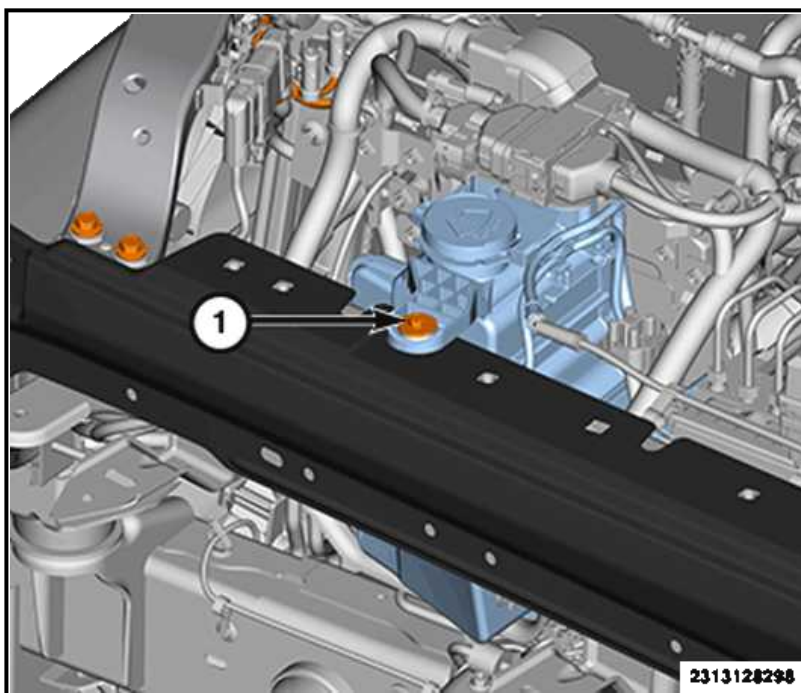
FENDER, FRONT

REMOVAL AND INSTALLATION

FRONT FENDER

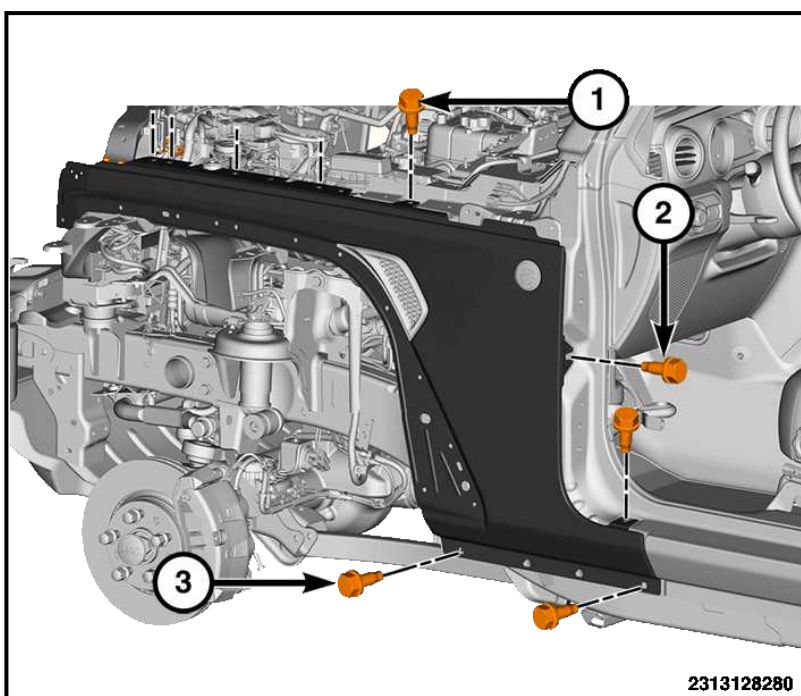
REMOVAL

1. Remove the upper and side cowl trim panel. Refer to [COVER, COWL PANEL, REMOVAL AND INSTALLATION](#).
2. Remove the wheel opening flare molding. Refer to [MOLDING, FRONT WHEEL OPENING, REMOVAL AND INSTALLATION](#) [MOLDING, REAR WHEEL OPENING, REMOVAL AND INSTALLATION](#).



1 - Fasteners

3. Remove the fasteners securing any accessories to the fender.



1 - Upper Bolt

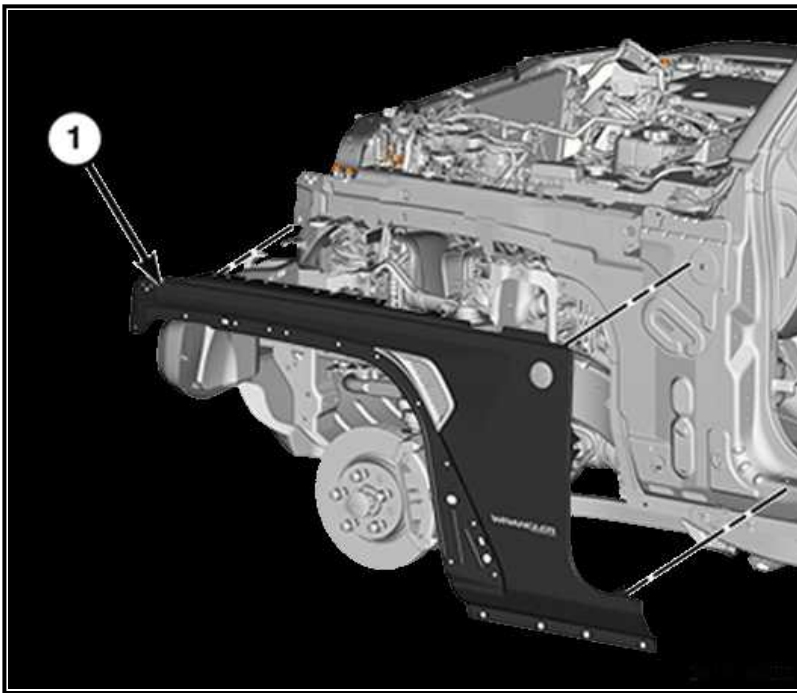
2 - A-Pillar Bolt

3 - Lower Bolt

4. Remove the lower bolt.

5. Remove the A-pillar bolts.

6. Remove the upper bolts.



1 - Fender

7. Remove the fender.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

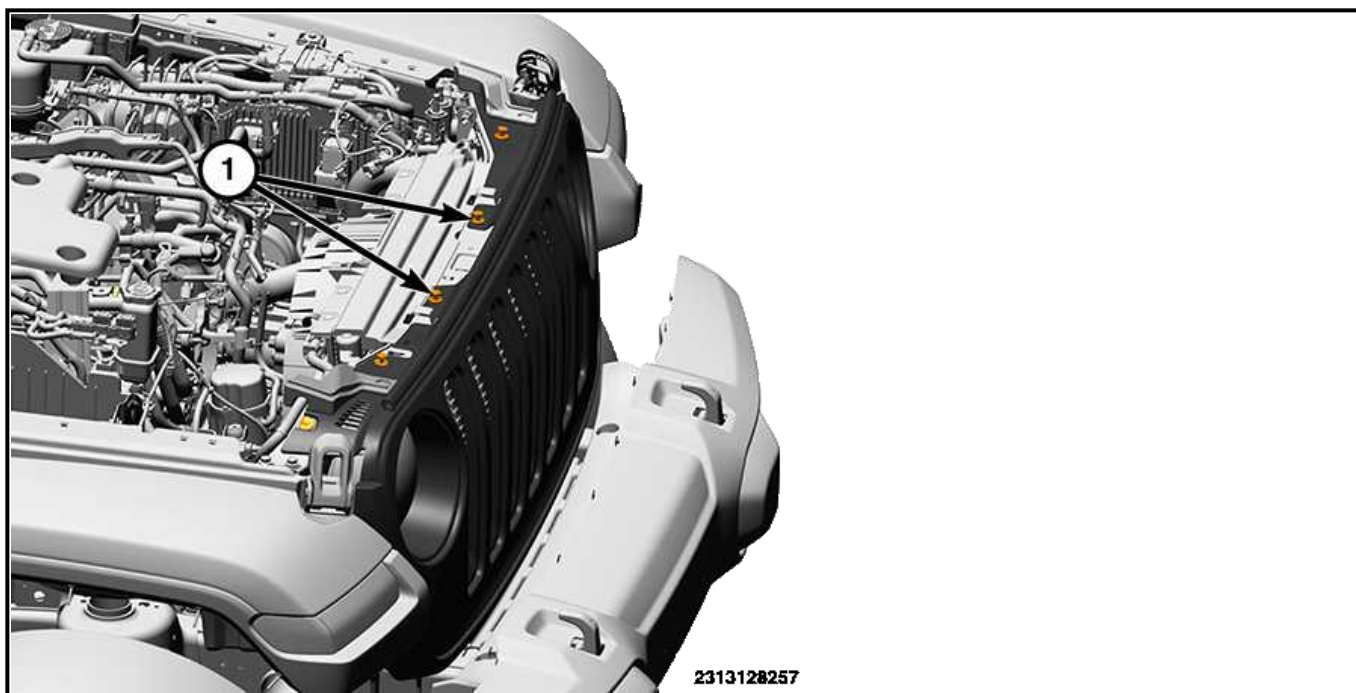
- Position the fender onto the vehicle and install all bolts without tightening.
- Check the fender positioning with the door and the hood. Refer to [GAP AND FLUSH, SPECIFICATIONS](#) .
- Tighten the upper bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the A-pillar bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the lower bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

GRILLE

REMOVAL AND INSTALLATION

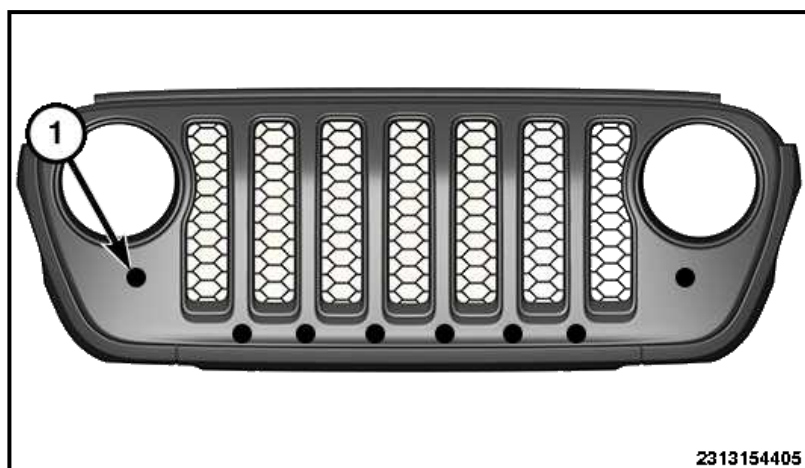
GRILLE

REMOVAL



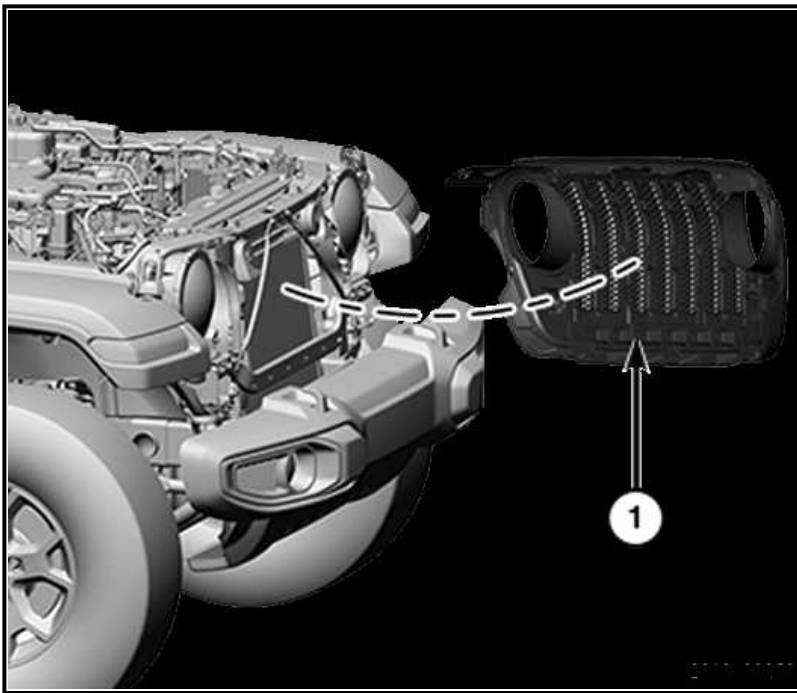
1 - Push Pins

1. Remove the push pins.



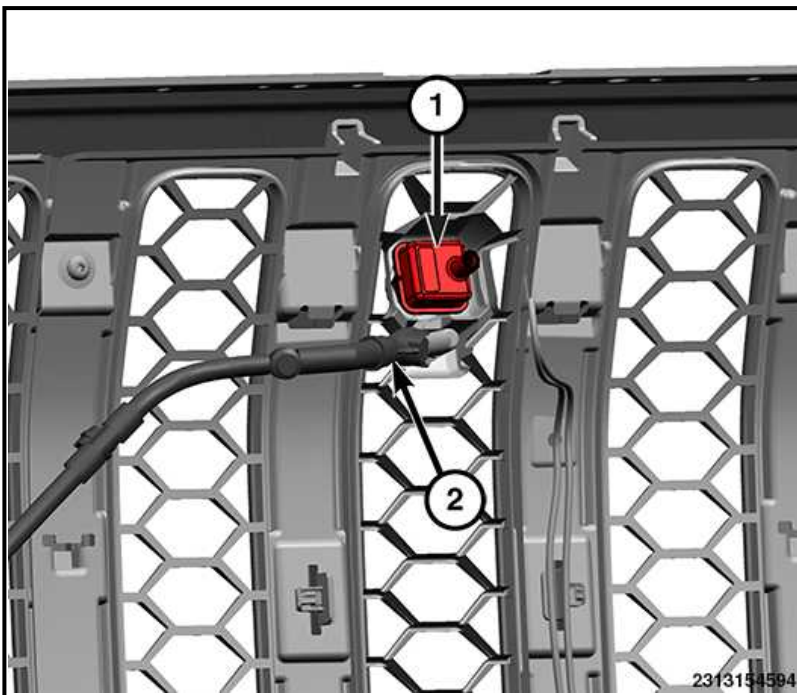
1 - Grille Lower Clip

2. Carefully release the grille lower clips.



1 - Grille

3. Separate and remove the grille.



1 - Camera Wire
2 - Washer Hose

4. Disconnect the camera wire harness connector and washer hose, if equipped.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify push pins are fully seated.

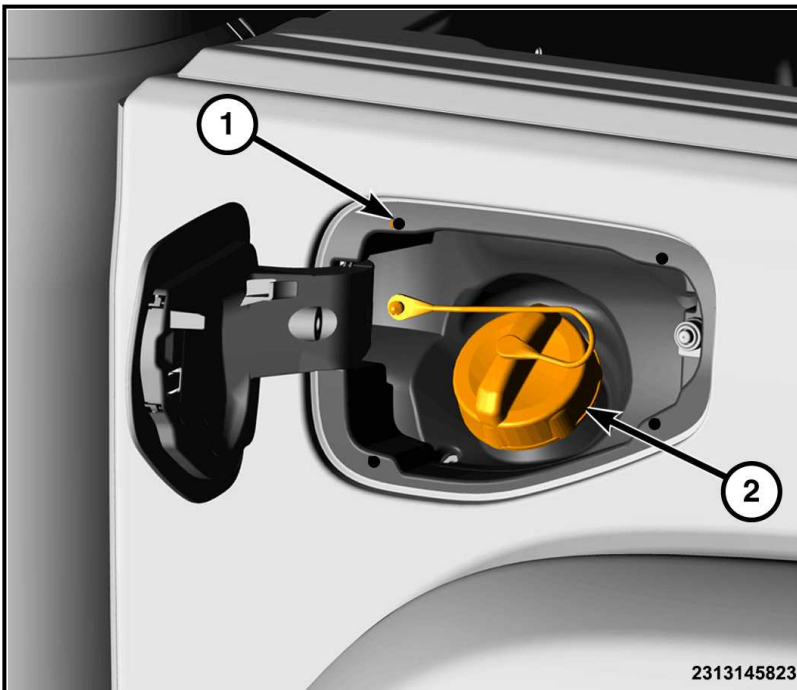
HOUSING, FUEL FILL

REMOVAL AND INSTALLATION

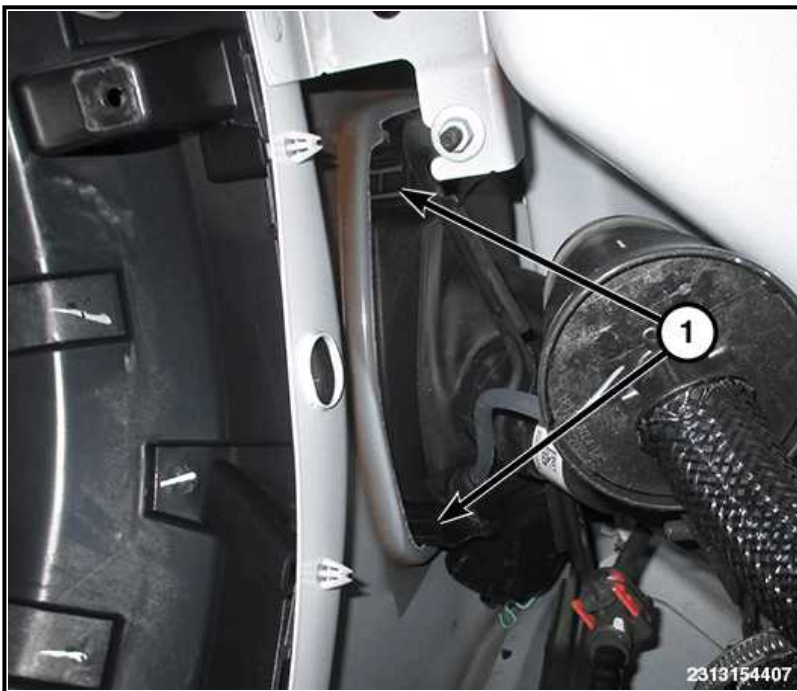
REMOVAL AND INSTALLATION

REMOVAL

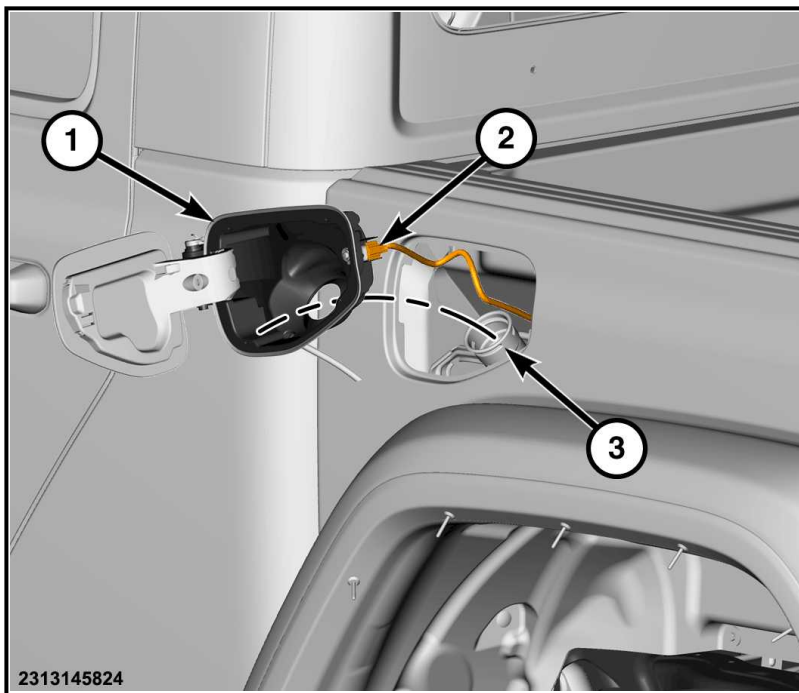
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



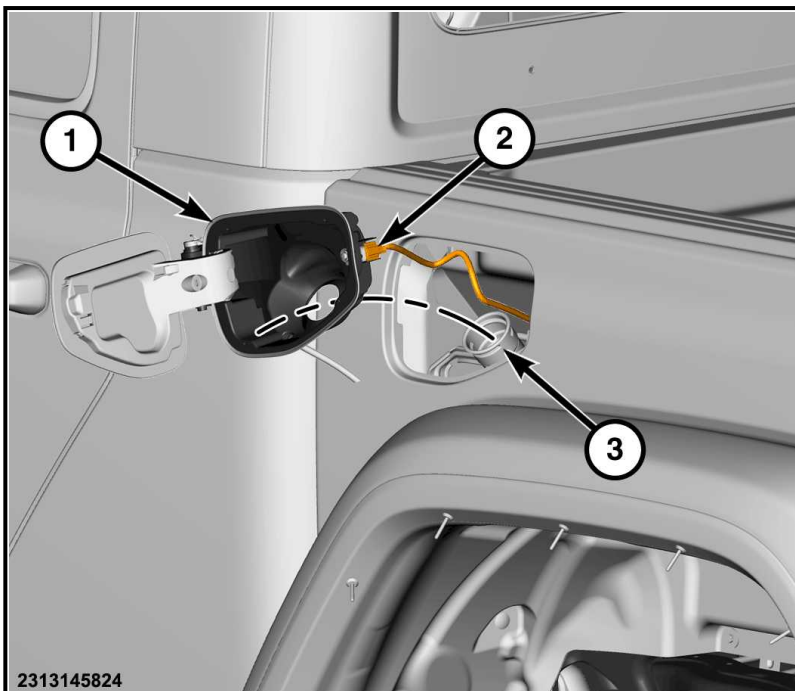
2. Remove the fuel cap (2) and disconnect the tether.
3. Remove the rear wheelhouse splash shield. Refer to [**SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION.**](#)



4. From inside the wheelhouse release the four retaining clips (1) rear first followed by the front clips.

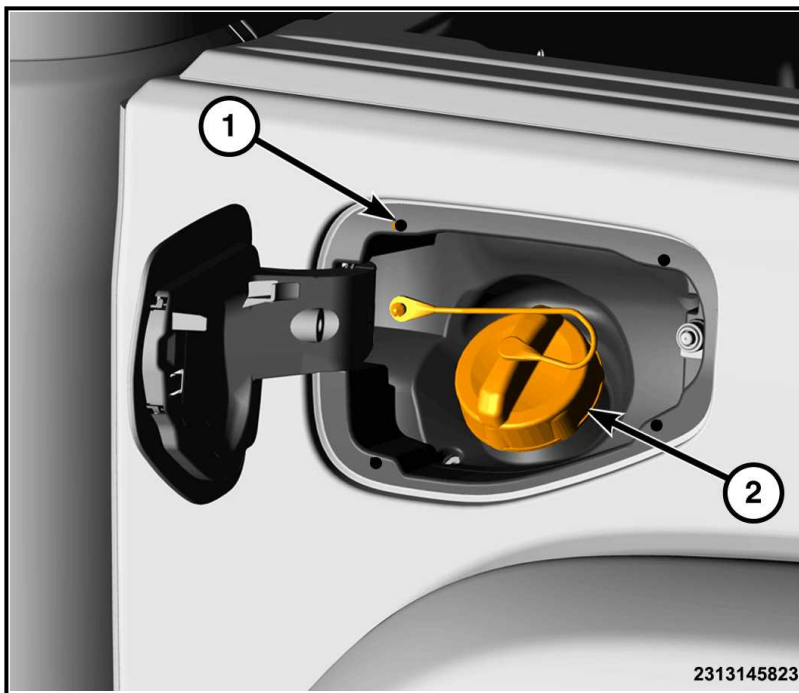


5. Separate the housing (1) from the body opening and the fuel filler neck (3).
6. Disconnect the wire harness connector (2) if equipped.



INSTALLATION

1. Connect the wire harness connector (2), if equipped.
2. Position the housing (1) into the body opening and over the fuel filler neck (3).



3. Seat the four clips (1) fully and install the cap and tether (2).
4. Install the rear wheelhouse splash shield. Refer to [SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to the appropriate service information .

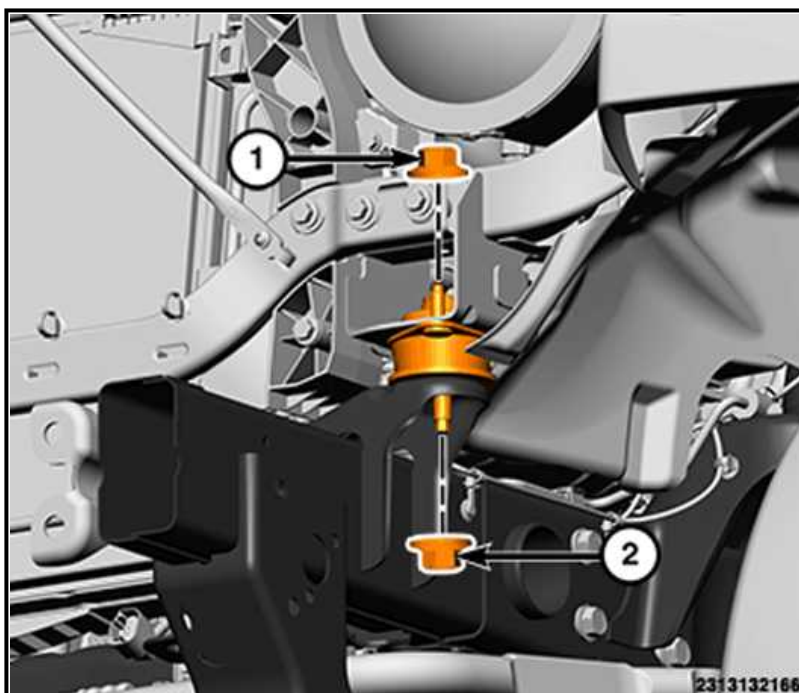
ISOLATOR, BODY

REMOVAL AND INSTALLATION

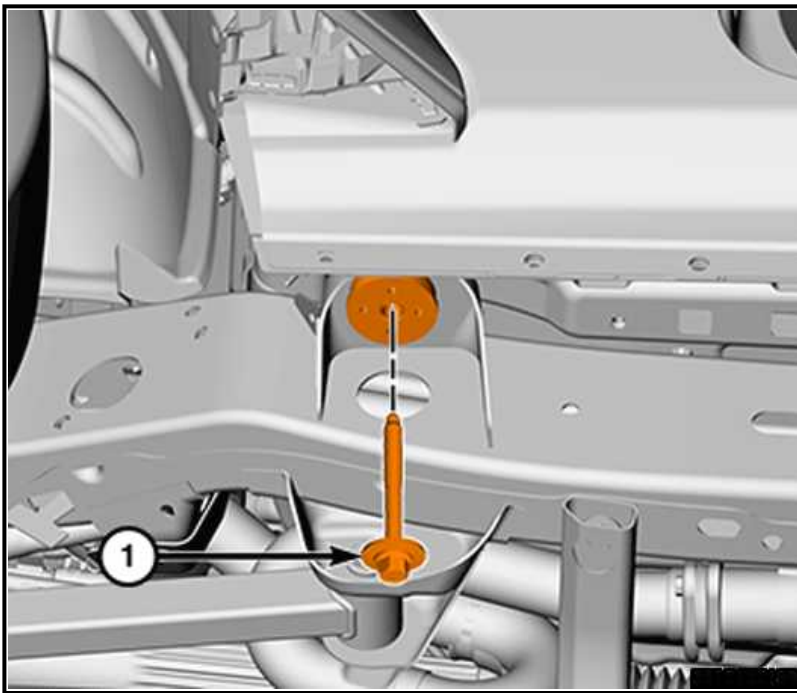
REMOVAL AND INSTALLATION

REMOVAL

1. If removing the front isolators remove the grille. Refer to [GRILLE, REMOVAL AND INSTALLATION](#).



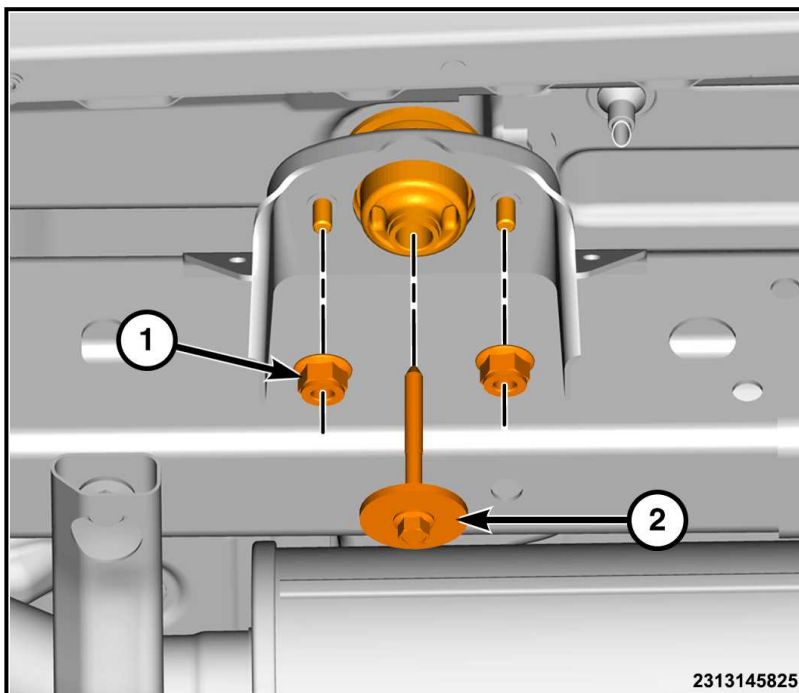
2. Loosen both front isolator nuts (1, 2).



3. Using an induction heating type tool, or equivalent, heat up each bolt to soften the thread locking compound on the bolt threads.

CAUTION: DO NOT use power tools to remove or install the fastener(s). If power tools are used, damage to the vehicle or components may occur.

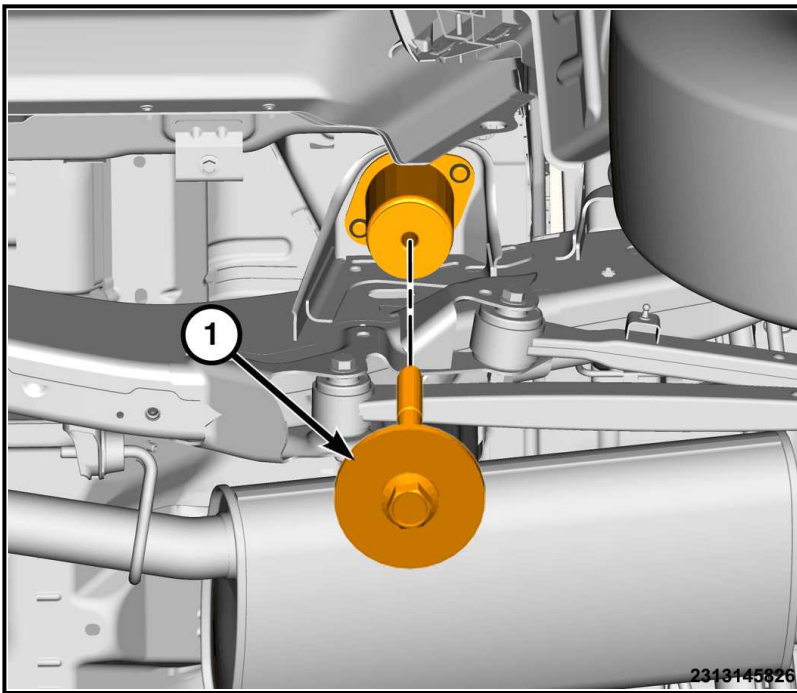
4. Loosen both front cab isolator bolts (1).



5. Loosen the isolator nuts (1).
6. Using an induction heating type tool, or equivalent, heat up each bolt to soften the thread locking compound on the bolt threads.

CAUTION: DO NOT use power tools to remove or install the fastener(s). If power tools are used, damage to the vehicle or components may occur.

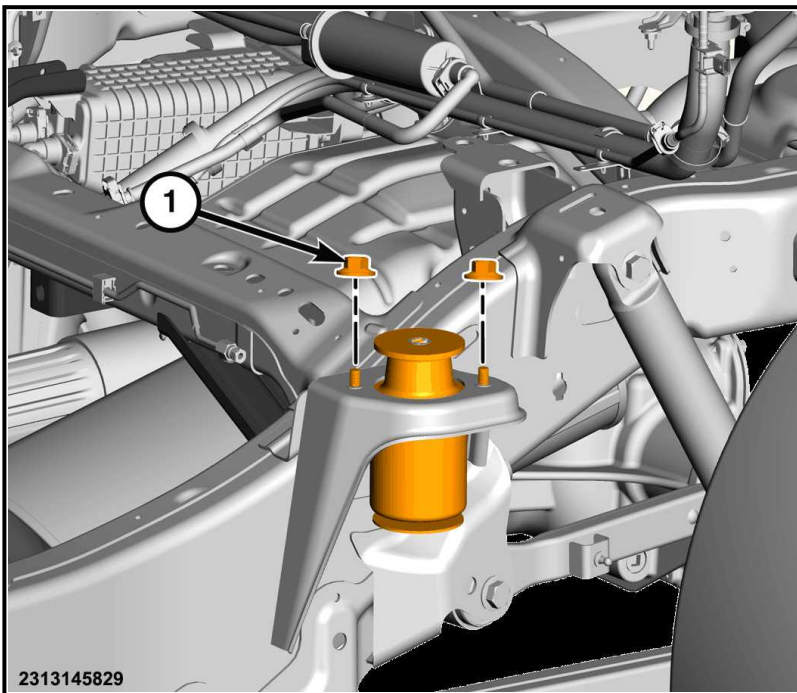
7. Loosen the cab bolts (2).



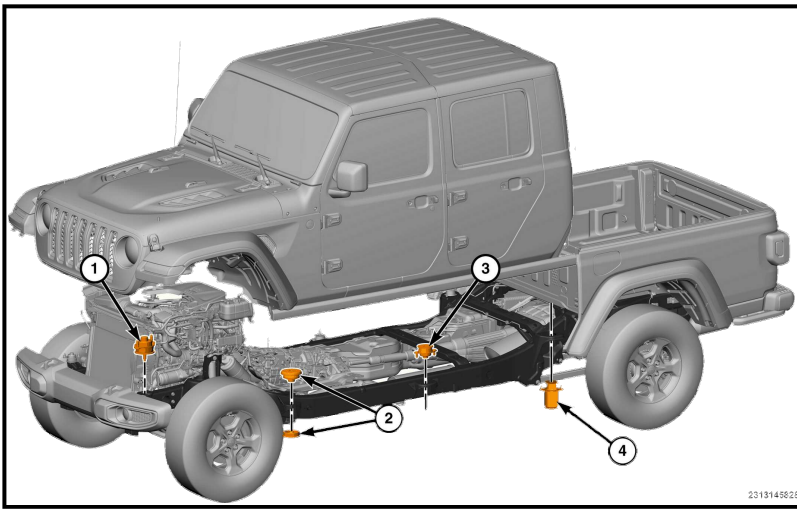
8. Using an induction heating type tool, or equivalent, heat up each bolt to soften the thread locking compound on the bolt threads.

CAUTION: DO NOT use power tools to remove or install the fastener(s). If power tools are used, damage to the vehicle or components may occur.

9. Loosen the rear isolator bolts (1).

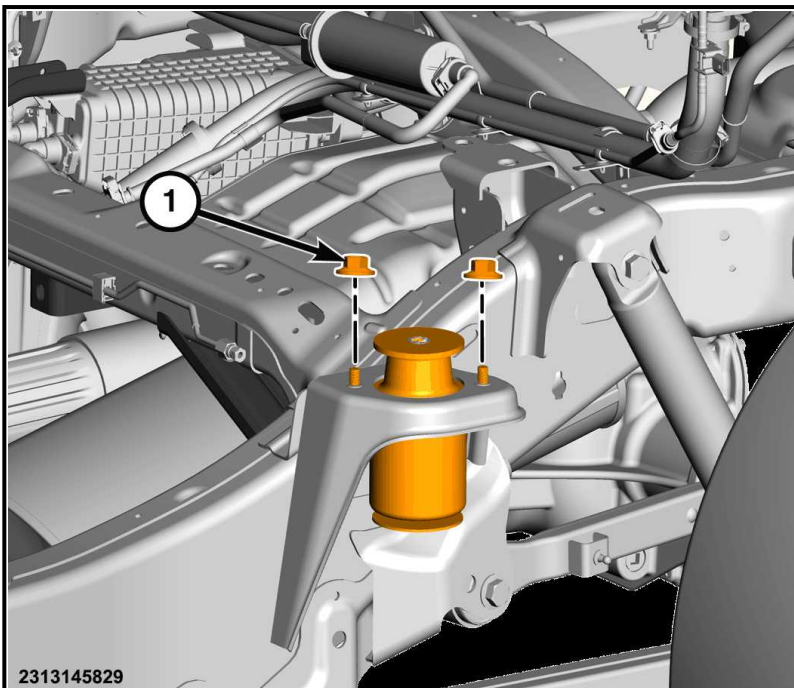


10. Remove the mounting bolts and isolator nuts (1) as necessary.



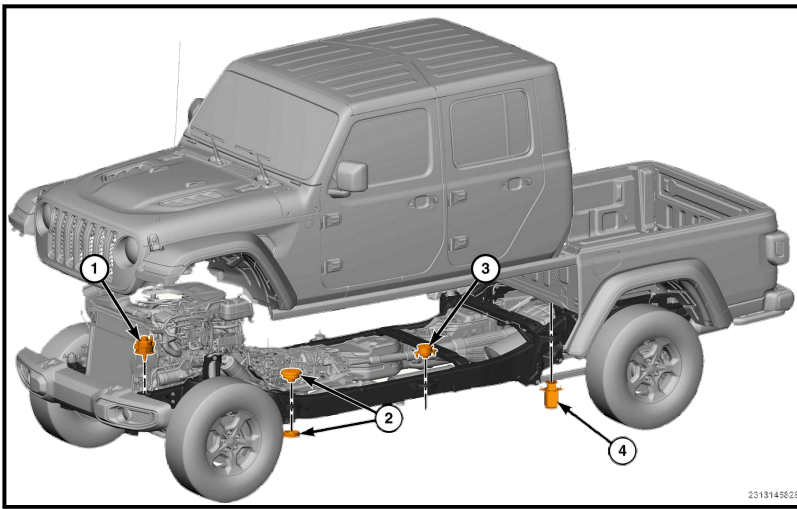
- 1 - FRONT ISOLATORS (2)
 2 - FRONT CAB ISOLATORS (2)
 3 - REAR ISOLATORS (6)
 4 - REAR CAB ISOLATORS (2)

11. Using a floor jack and wooden block under the body sill, lift the body to gain access to the isolators (1-4) and remove the isolators as necessary.



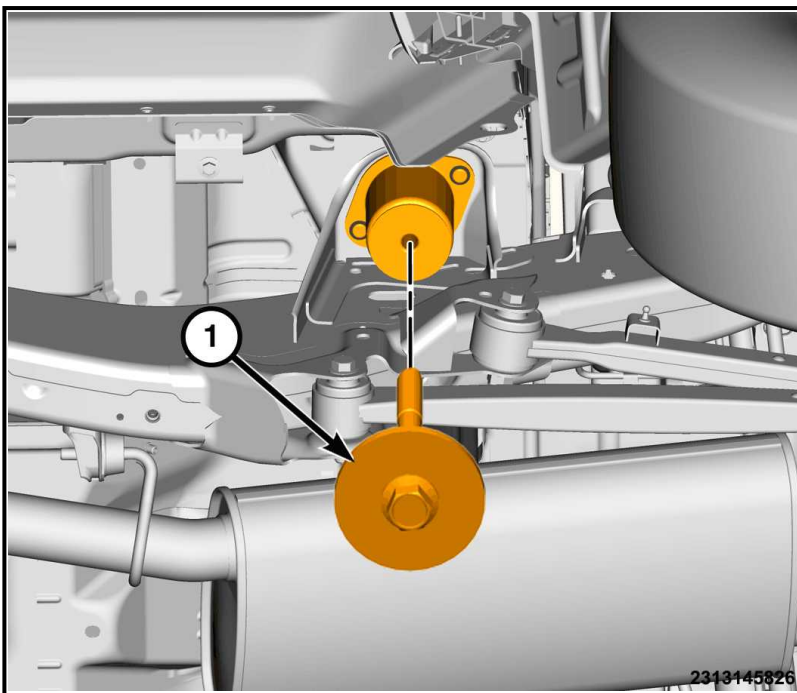
INSTALLATION

1. Position the rear isolator onto the frame and install the nuts (1).
2. Tighten the nuts (1) to the proper. Refer to [TORQUE SPECIFICATIONS](#).

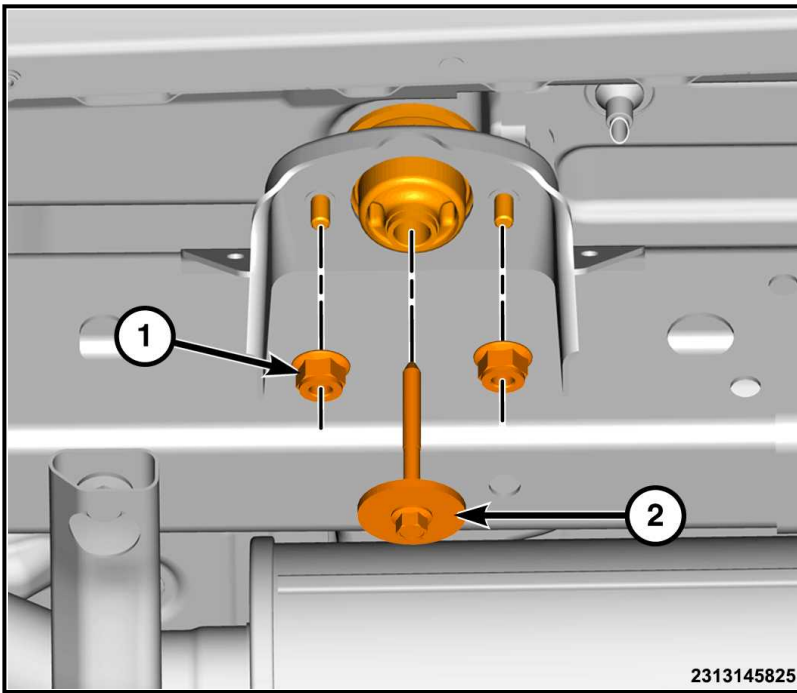


- 1 - FRONT ISOLATORS (2)
 - 2 - FRONT CAB ISOLATORS (2)
 - 3 - REAR ISOLATORS (6)
- B

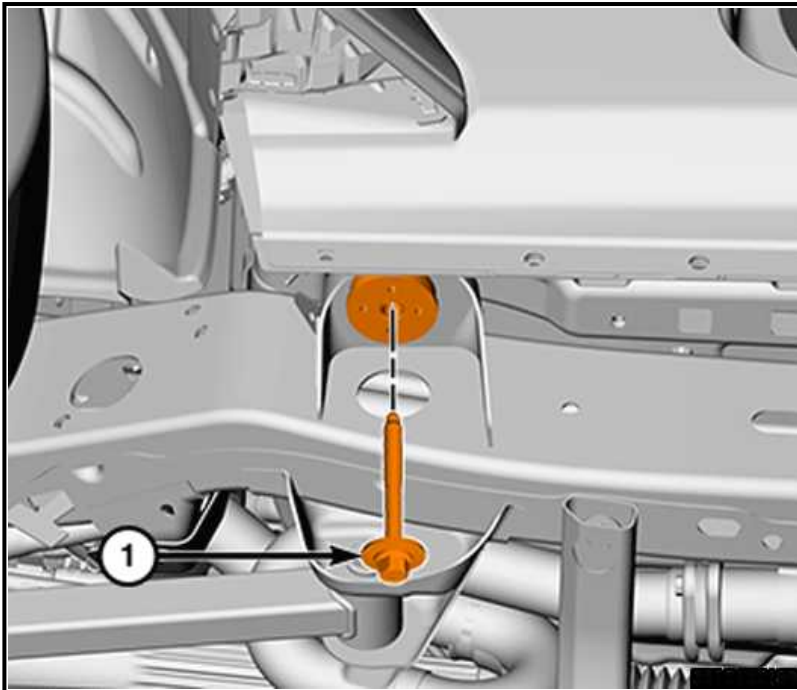
3. Position the isolators (1 - 3) under the body as necessary.
4. Lower the cab onto the isolators.



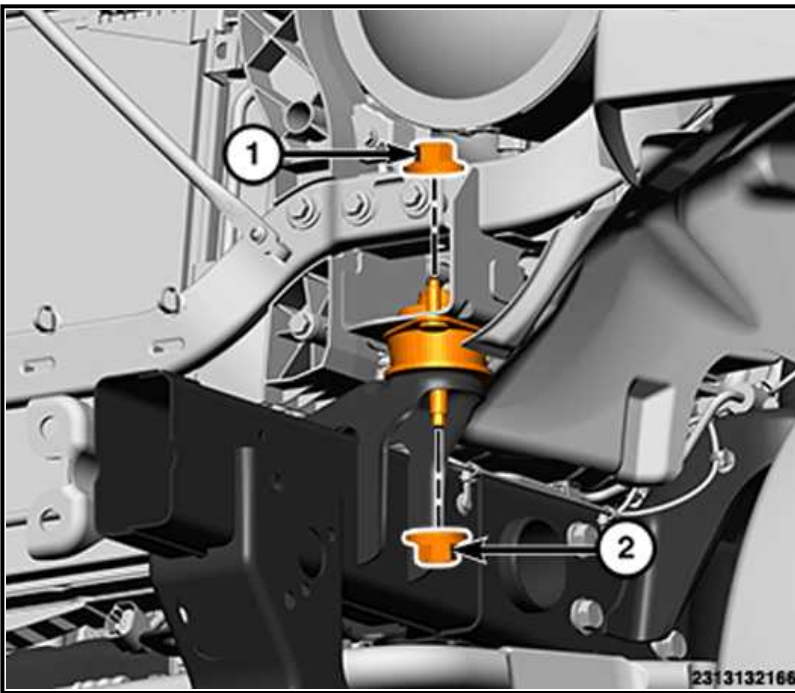
5. Install the mounting bolt (1) and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .



6. Install the mounting bolt (2) and isolator nuts (1) and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



7. Install the mounting bolt (1) and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



8. Install the isolator nuts (1 and 2) tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
9. If removed, install the grille. Refer to [GRILLE, REMOVAL AND INSTALLATION](#).

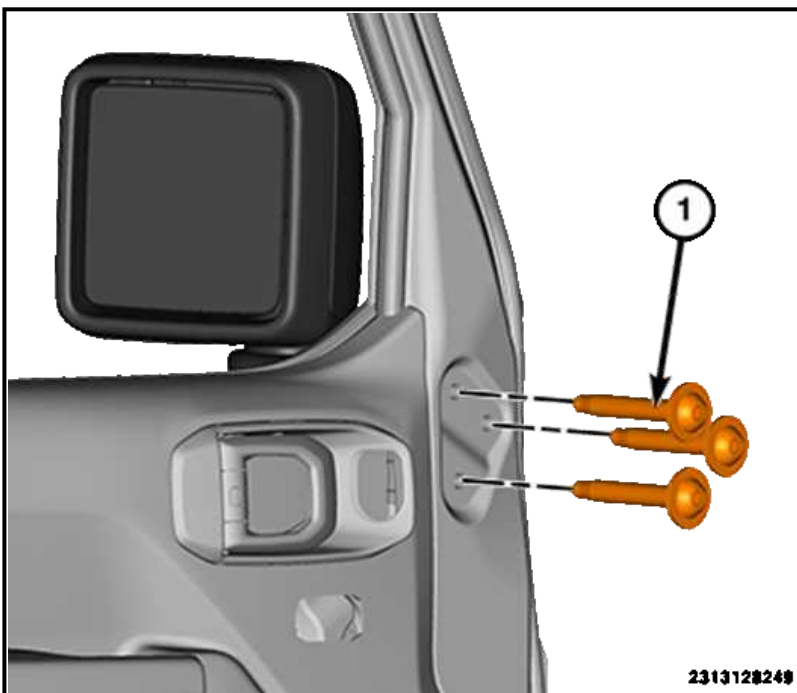
MIRROR, OUTSIDE REARVIEW

REMOVAL AND INSTALLATION

OUTSIDE REARVIEW MIRROR

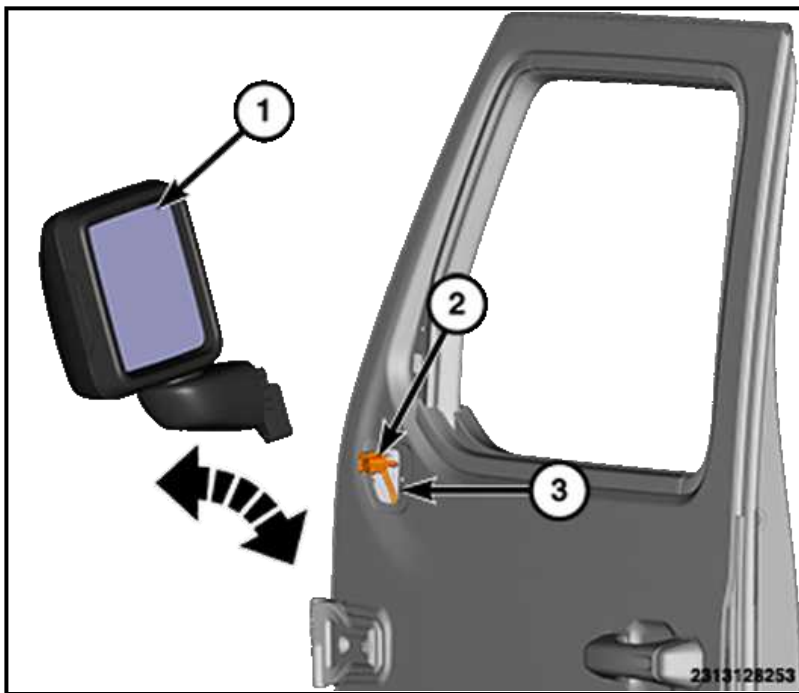
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



1 - Outside Rearview Mirror Bolts

2. Remove the outside rearview mirror bolts.



1 - Mirror Assembly
2 - Wire Harness Connector
3 - Door Opening

3. Separate the mirror assembly and disconnect the wire harness connector.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the outside rearview mirror bolts and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .

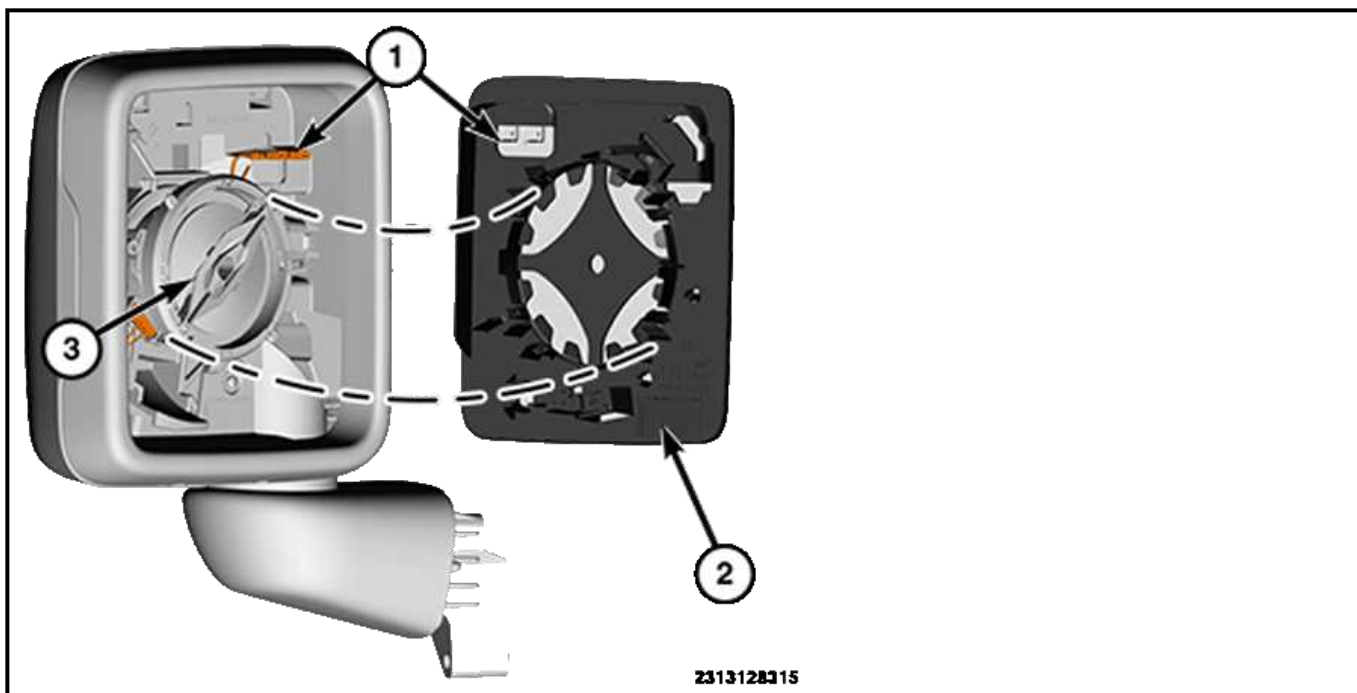
MIRROR, OUTSIDE REARVIEW, GLASS

REMOVAL AND INSTALLATION

GLASS OUTSIDE REARVIEW MIRROR

REMOVAL

WARNING: Always wear eye and hand protection when servicing the mirror assembly. Failure to observe these warnings may result in personal injury from broken glass.



1 - Electrical Connector

2 - Mirror Glass

3 - Mirror Assembly

1. Position the mirror glass so that it is facing in toward the vehicle as far as possible.
2. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
3. Place thumbs behind mirror glass and push out from the mirror assembly. This will release the mirror glass case's snap attachment feature.
4. If equipped, disconnect the electrical connectors and remove the glass.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: Pressure must be applied equally over the center portion of the mirror glass to fully engage the mirror glass retaining clips to the mirror motor.

- Using one hand, carefully push the mirror glass onto the mirror motor, while at the same time supporting the mirror housing from the backside with the other hand. Firmly push on the mirror glass holder until all mirror glass retaining clips are seated fully.
- Verify retention of the mirror glass holder by gently pulling outward on the glass.

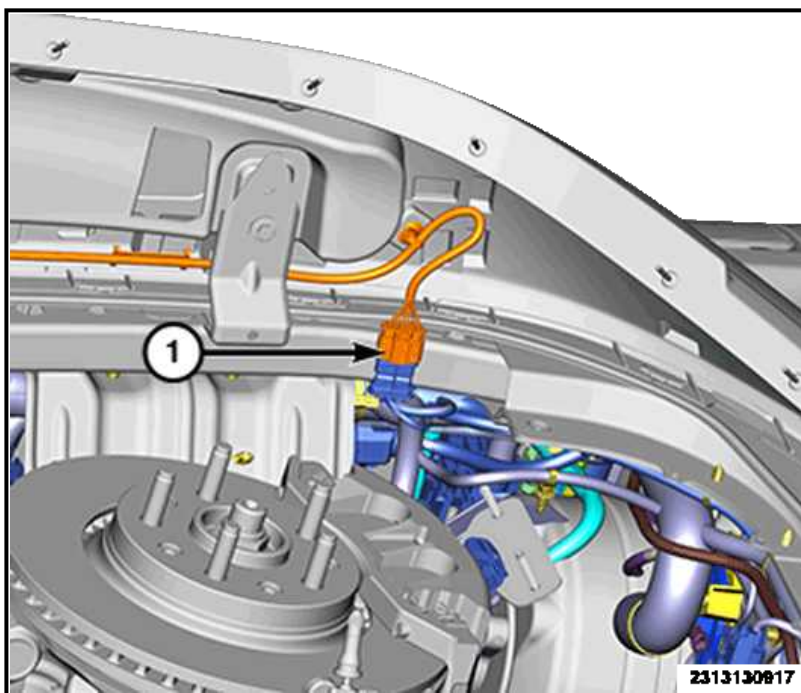
MOLDING, FRONT WHEEL OPENING

REMOVAL AND INSTALLATION

FRONT WHEEL OPENING MOLDING

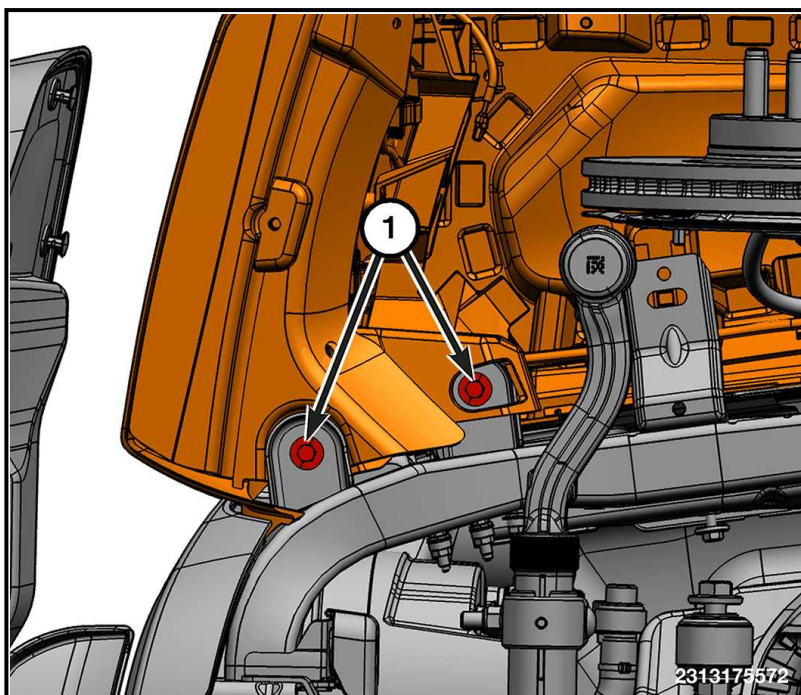
REMOVAL

1. Remove the wheelhouse splash shield. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) .



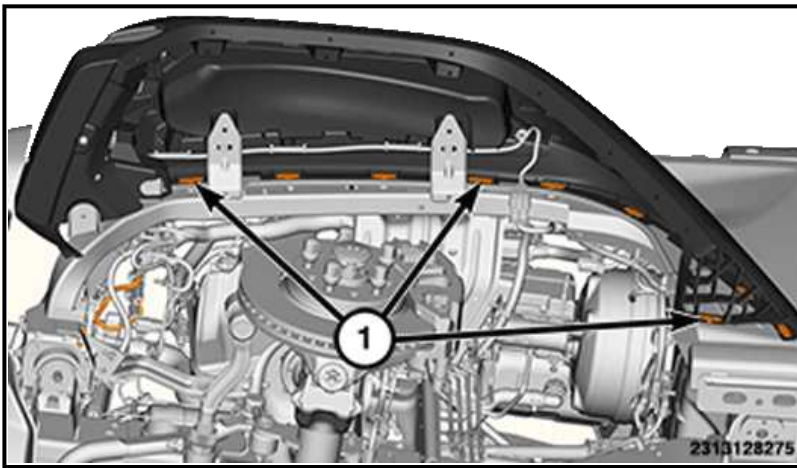
1 - Turn Signal Lamp Wire Harness Connector

2. Disconnect the turn signal lamp wire harness connector.



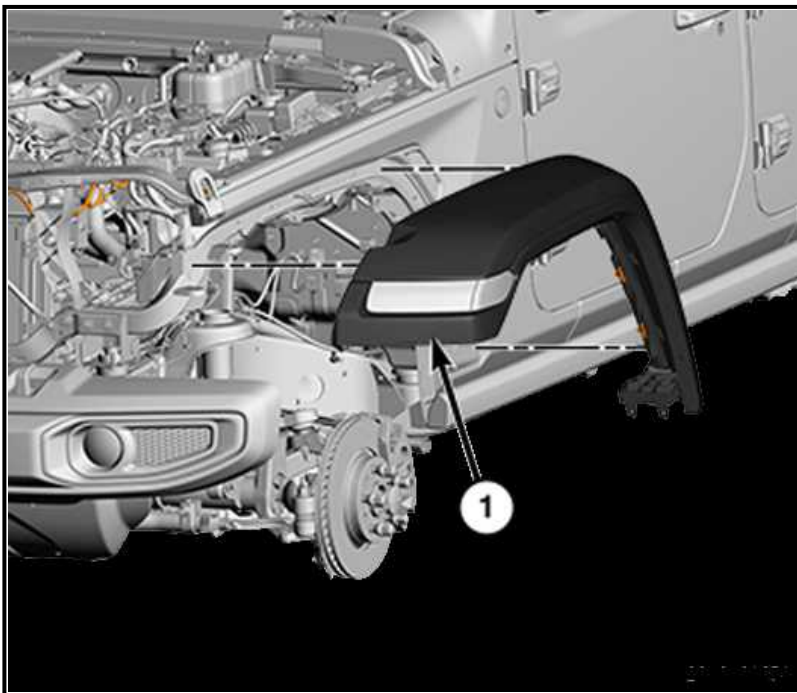
1 - Mounting Bolts

3. Remove the mounting bolts.



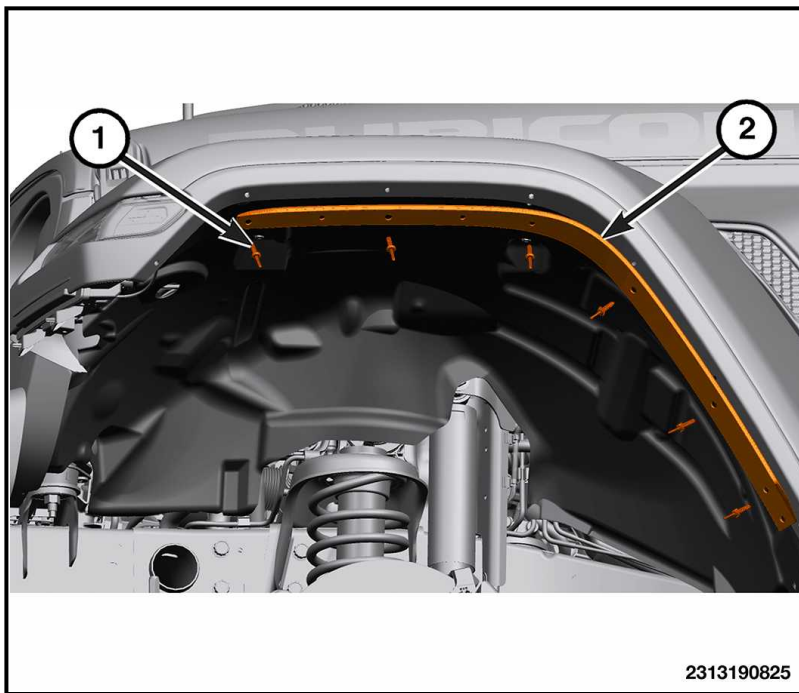
1 - Retaining Clips

4. Using a (special tool #C-4829A, Remover, Trim) or equivalent, release and **DISCARD** the retaining clips.



1 - Flare Molding

5. Remove the flare molding.



1 - Rivet
2 - Flare Extension

6. Remove the rivets and the flare extension, if equipped.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install and seat the **NEW** retaining clips fully.
- Install the bolts and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
- Install **NEW** rivets on to the flare extension, if equipped.

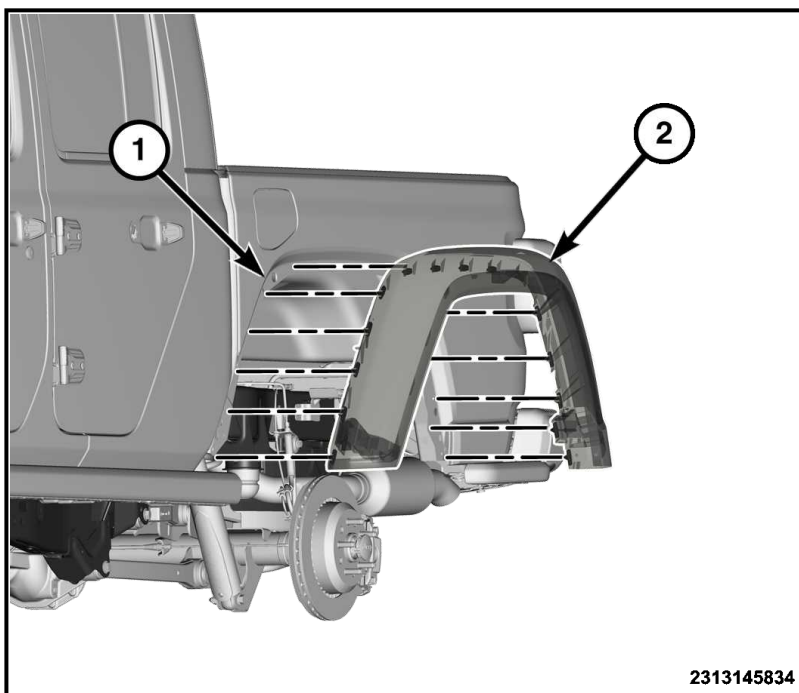
MOLDING, REAR WHEEL OPENING

REMOVAL AND INSTALLATION

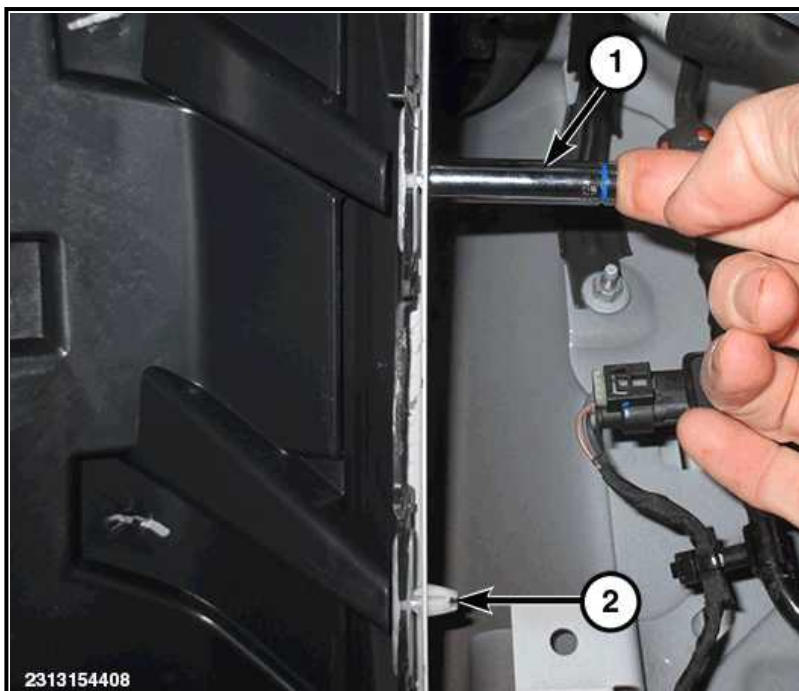
REMOVAL AND INSTALLATION

REMOVAL

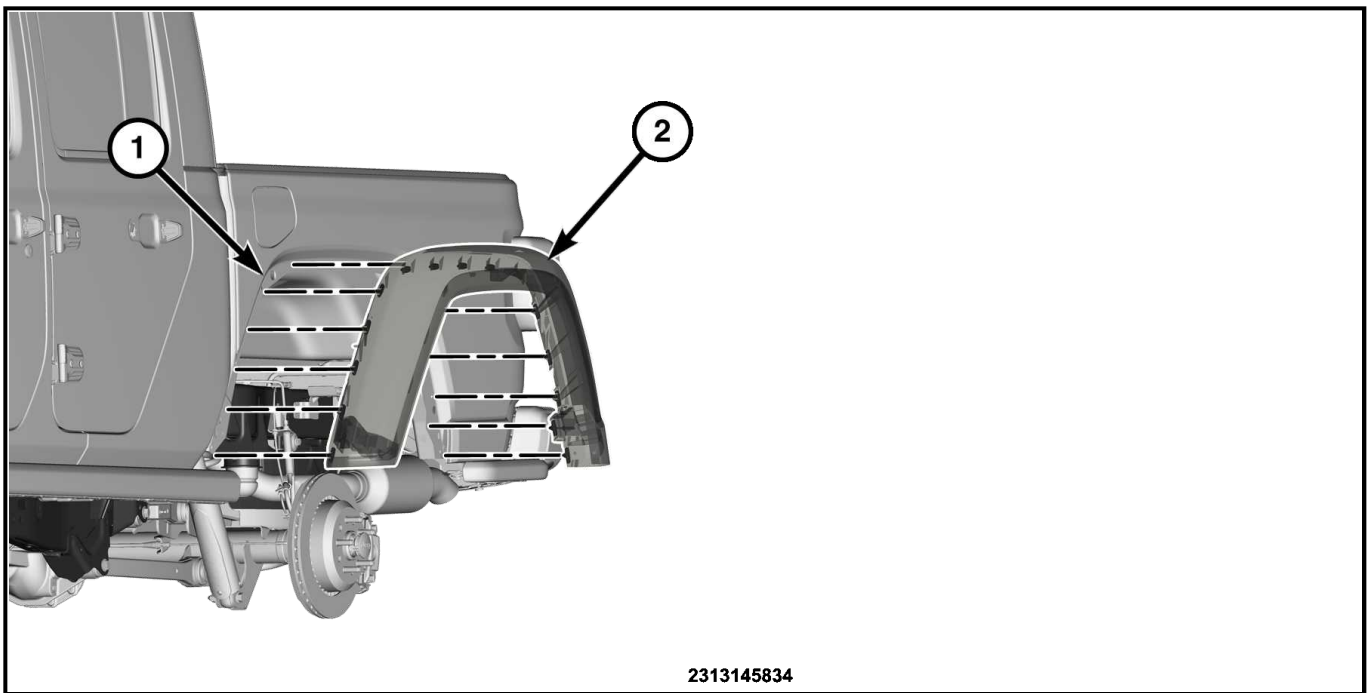
1. Remove the wheelhouse splash shield. Refer to **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION**.



2. Using trim stick (special tool #C-4755, Trim Stick) or equivalent, equivalent to release the 15 spring retainers and remove the flare molding (1).



3. It may be necessary to release the clips (2) from the inside using a small socket (1) or equivalent.



INSTALLATION

1. Install the flare molding (1) onto the wheel opening (2) and seat the 15 retaining clips fully.
2. Install the wheelhouse splash shield. Refer to [**SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION**](#).

NAMEPLATE

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

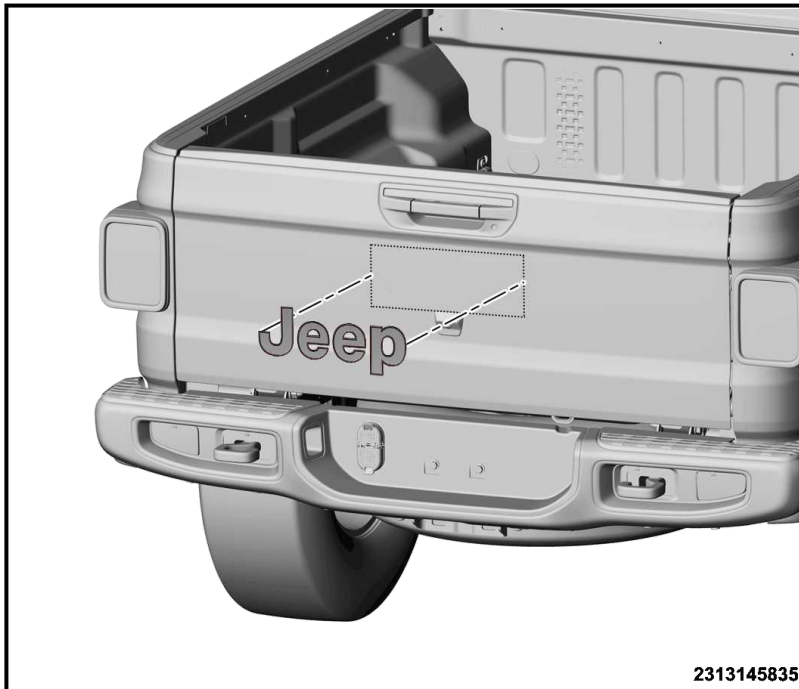


NOTE: Exterior nameplates are attached to body panels with adhesive tape.

REMOVAL

1. Apply a length of masking tape on the body, parallel to the top edge of the nameplate to use as a guide, if necessary.

2. If temperature is below 21B°C (70B°F), warm emblem with a heat lamp or gun. Do not exceed 52B°C (120B°F) when heating emblem.
3. Insert a plastic trim stick or a hard wood wedge behind the emblem to separate the adhesive backing from the body.
4. Clean adhesive residue from body with MOPARB® Super Kleen solvent or equivalent.



5. Repeat steps 1 - 4 for the rear nameplate.

INSTALLATION

1. Remove carrier from adhesive tape on back of emblem.
2. Position emblem properly on body.
3. Press emblem firmly to body with palm of hand.
4. If temperature is below 21B°C (70B°F), warm emblem with a heat lamp or gun to assure adhesion. Do not exceed 52B°C (120B°F) when heating emblem.



5. Repeat steps 1 - 4 for the side nameplates.

RAILS, UTILITY

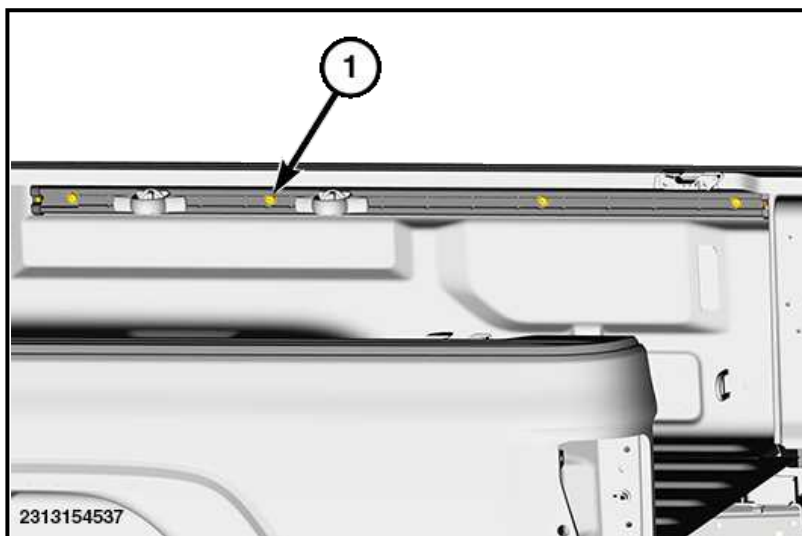
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

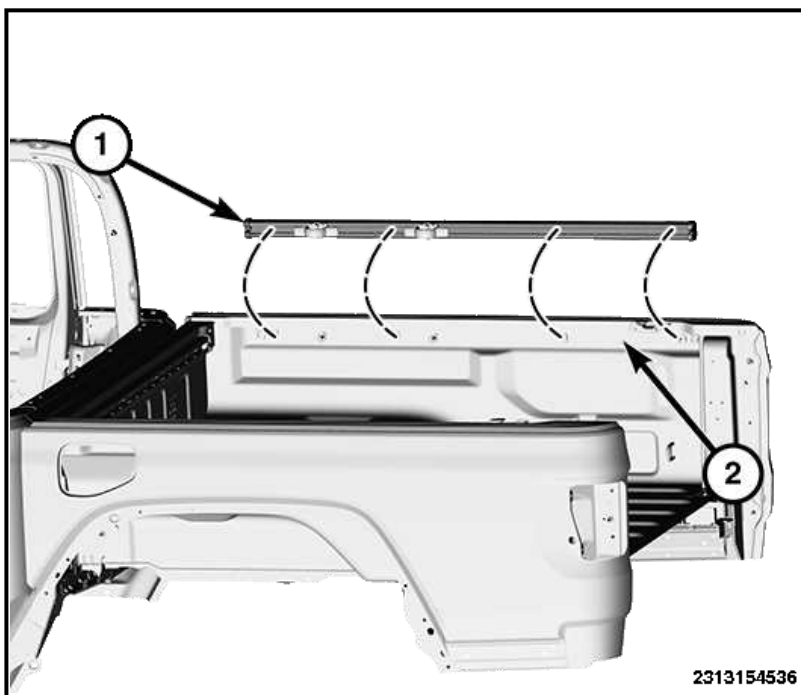


REMOVAL - SIDE

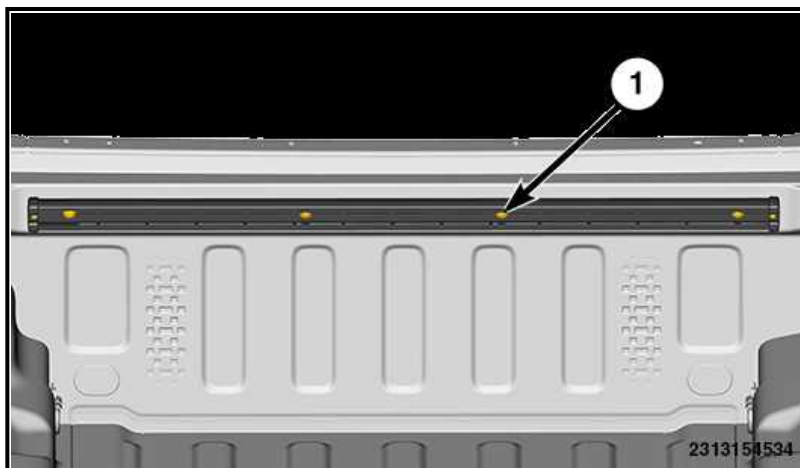
1. Remove the end fastener (1).



2. Remove the side fasteners (1).

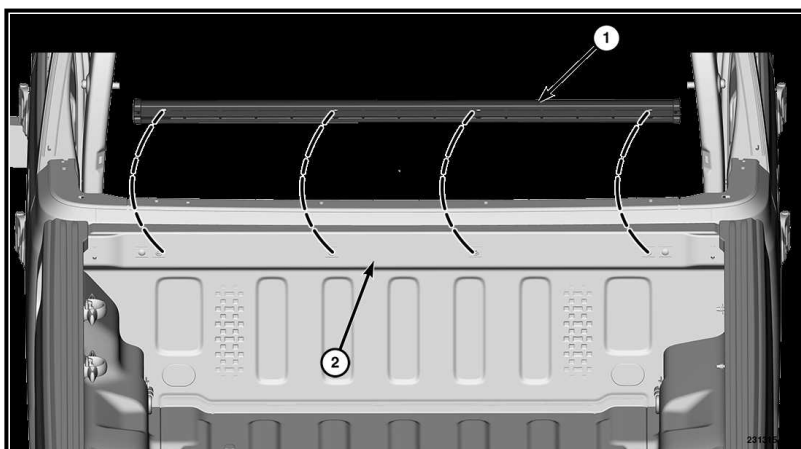


3. Remove the side rail (1) from the box side (2).

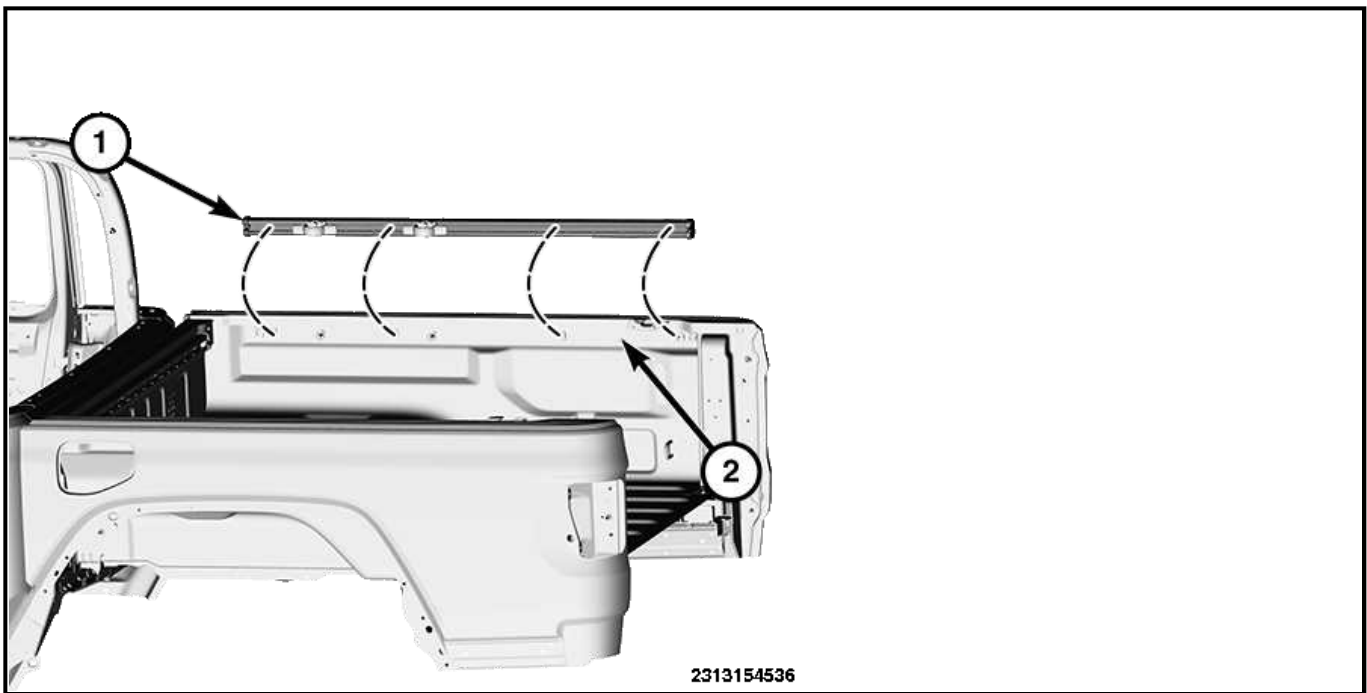


REMOVAL - FRONT

1. Remove the fasteners (1).

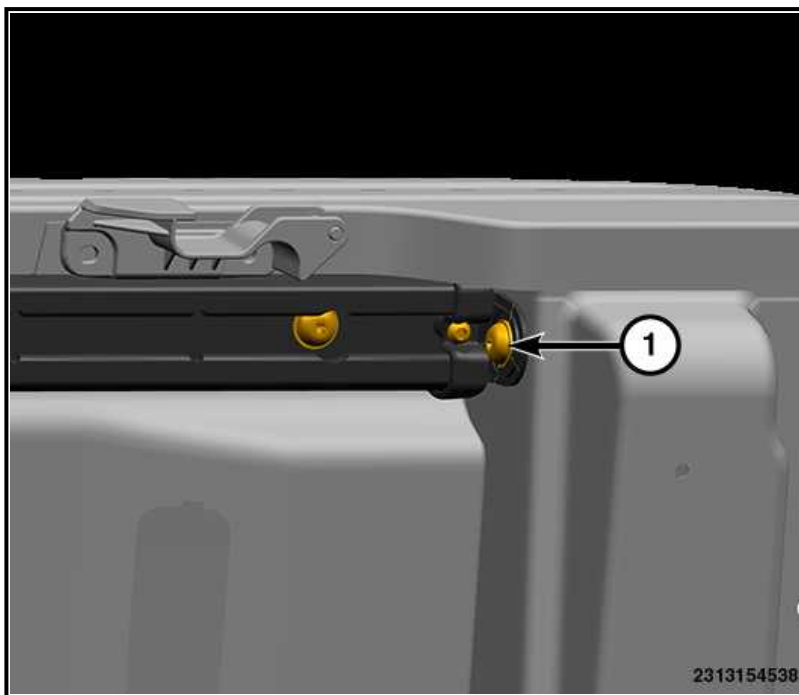


2. Remove the front rail (1) from the box front (2).

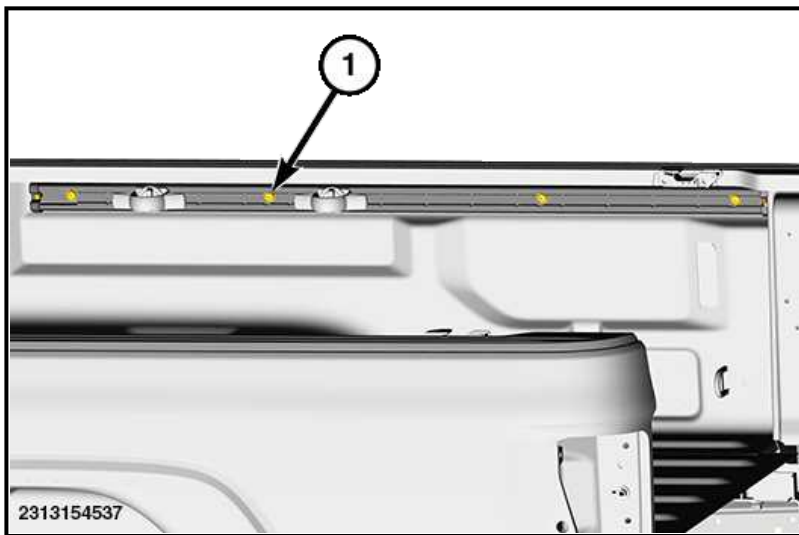


INSTALLATION - SIDE

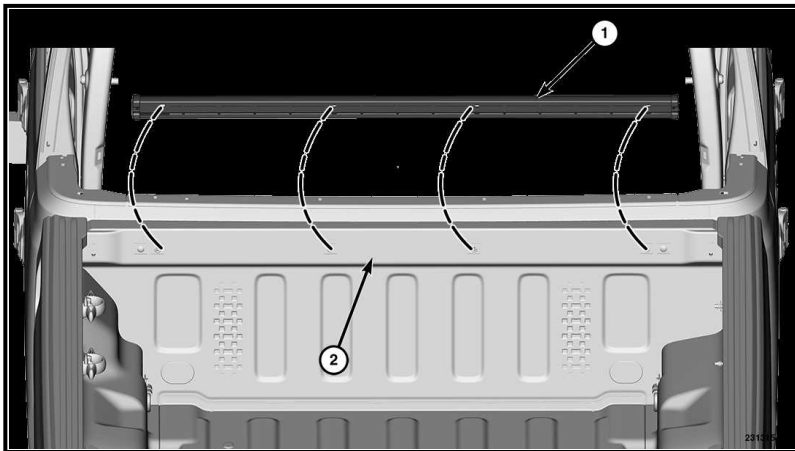
1. Install the side rail assembly (1) back onto the box side (2).



2. Install the end fastener (1) and tighten to the proper. Refer to [**TORQUE SPECIFICATIONS**](#) .

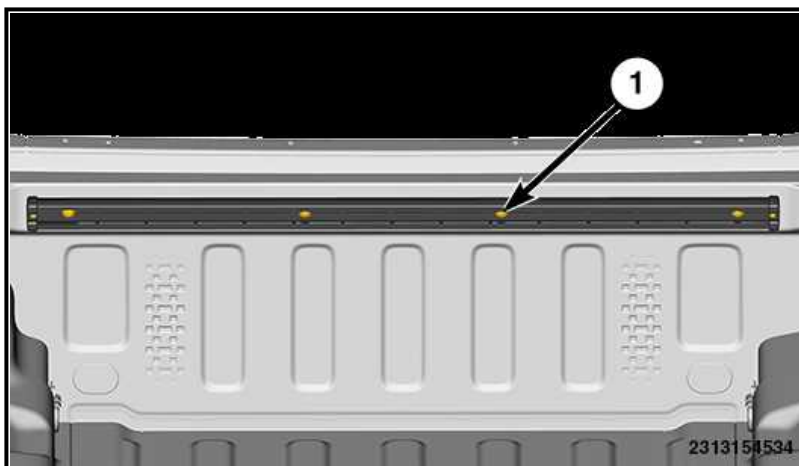


3. Install the side fasteners (1) and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .



INSTALLATION - FRONT

1. Install the front rail assembly (1) back onto the box front (2).



2. Install the front fasteners (1) and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

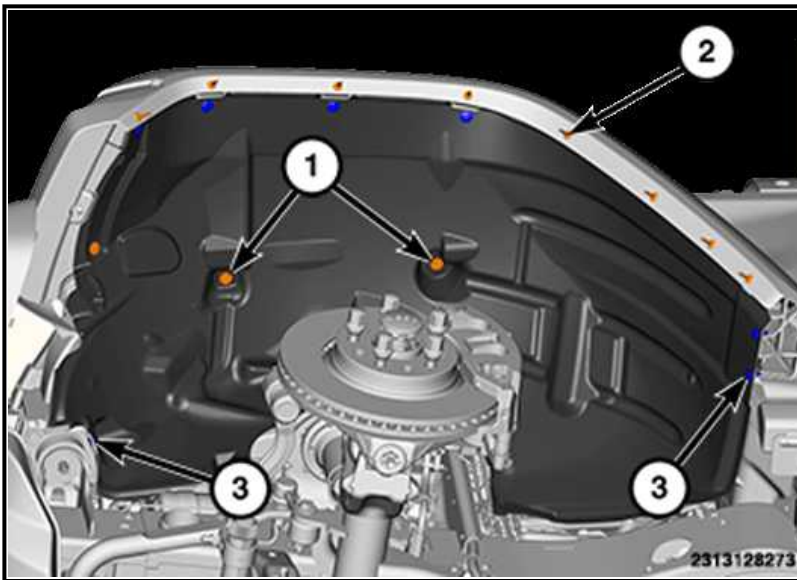
SHIELD, SPLASH, FRONT WHEELHOUSE

REMOVAL AND INSTALLATION

FRONT WHEELHOUSE SPLASH SHIELD

REMOVAL

1. Remove the wheel. Refer to [REMOVAL AND INSTALLATION](#) .



1 - Screws
2 - Rivets
3 - Push Pin Fasteners

2. Remove the screws.
3. Remove and discard the push pin fasteners.
4. Remove the rivets securing the splash shield to the flare molding.
5. Remove the splash shield.

INSTALLATION

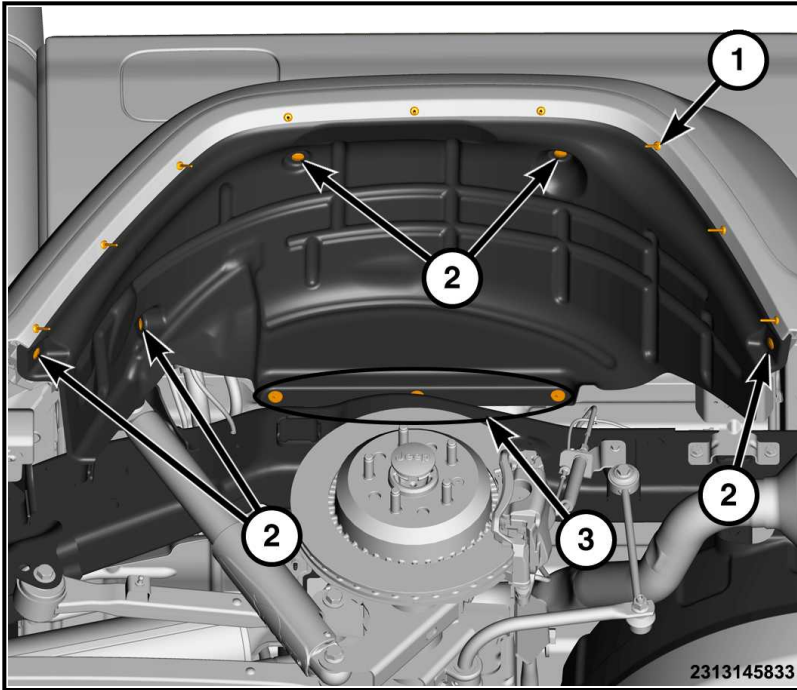
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the
NEW
rivets.
- Install the
NEW
push pin fasteners.
- Install the screws and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

SHIELD, SPLASH, REAR WHEELHOUSE

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Remove the rivets (1) securing the splash shield to the flare molding.
2. Remove the five push pin fasteners (2) and remove the splash shield.
3. Remove the three screws (3).

INSTALLATION

1. Install the splash shield and install the five push pin fasteners.
2. Install the three screws.
3. Install new rivets securing the splash shield to the flare molding.

STEP, SIDE

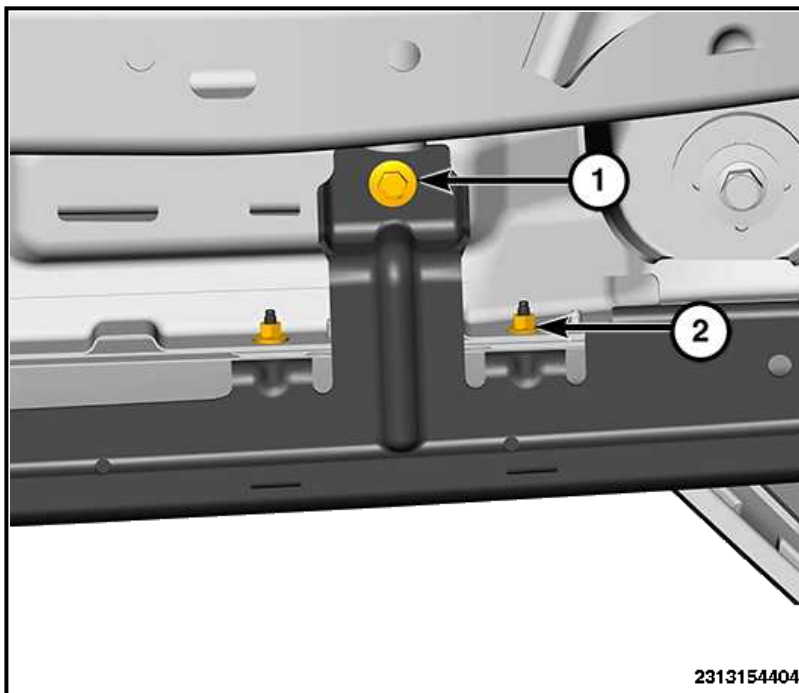
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

NOTE: Side steps and rock rails are similar.

REMOVAL

1. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .



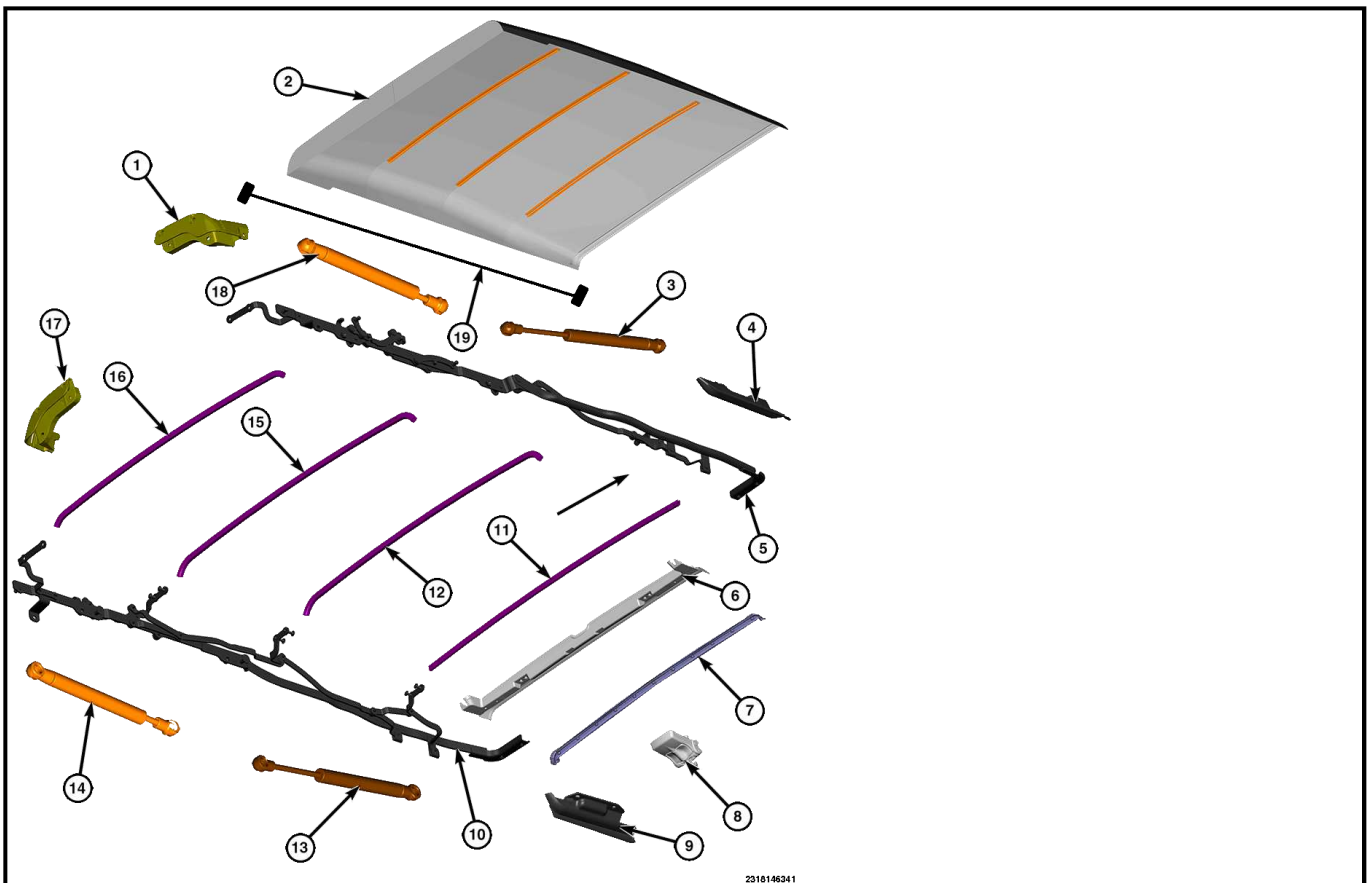
2. Remove the eight nuts (2).
3. Remove the four bolts (1) and remove the side step.

INSTALLATION

1. Install the side step and install the four bolts hand tight.
2. Install the eight nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#).
3. Tighten the bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#).

FOLDING SOFT TOP, 4 DOOR

DESCRIPTION



1 - BRACKET BOW #5 RIGHT	11 - BOW ASSEMBLY #2
2 - COVER ASSEMBLY	12 - BOW ASSEMBLY #3
3 - FRONT GAS PROP RIGHT	13 - FRONT GAS PROP LEFT
4 - BOW SEAL RIGHT	14 - REAR GAS PROP LEFT
5 - LINKAGE ASSEMBLY RIGHT	15 - BOW ASSEMBLY #4
6 - BOW ASSEMBLY #1	16 - BOW ASSEMBLY #5
7 - COMPRESSION PANEL BOW #1	17 - BRACKET BOW #5 LEFT
8 - LATCH BOW #1	18 - REAR GAS PROP RIGHT
9 - BOW SEAL LEFT	19 - TENSION CABLE(S)
10 - LINKAGE ASSEMBLY LEFT	B

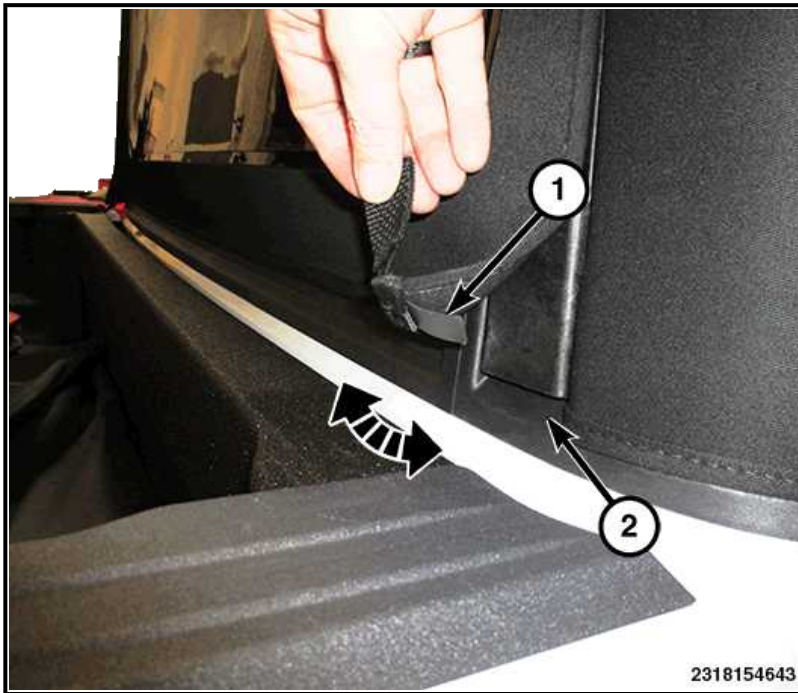
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

NOTE:

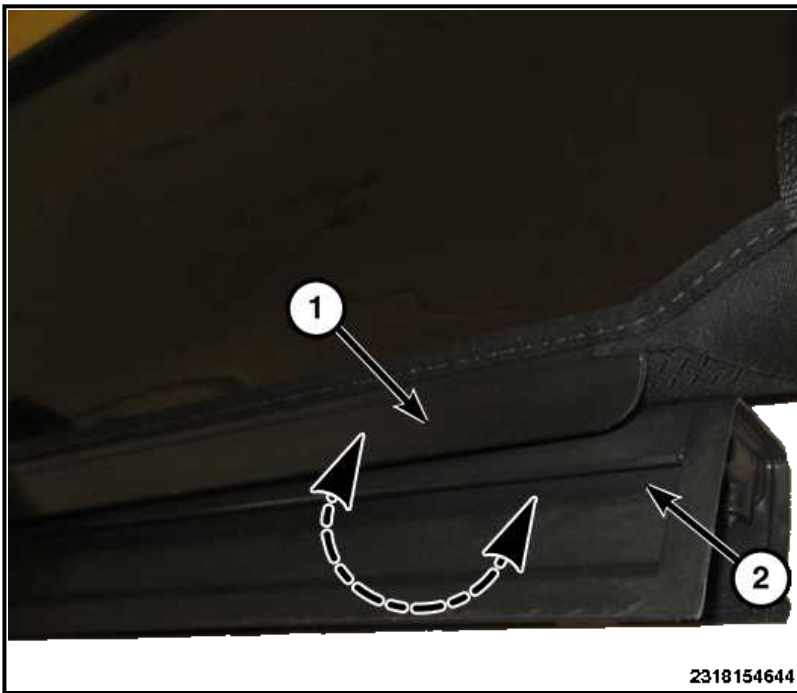
If the temperature is below 72B°F (24B°C) and/or the top has been folded down for a period of time, the top will appear to have shrunk when you raise it, making it difficult to put up. This is caused by a natural contraction of the vinyl coating on the fabric top.

Place the vehicle in a warm area. Pull steadily on the top fabric. The vinyl will stretch back to its original size and the top can then be installed. If the temperature is 41B°F (5B°C) or below, do not attempt to put the top down or roll the rear or side curtains.

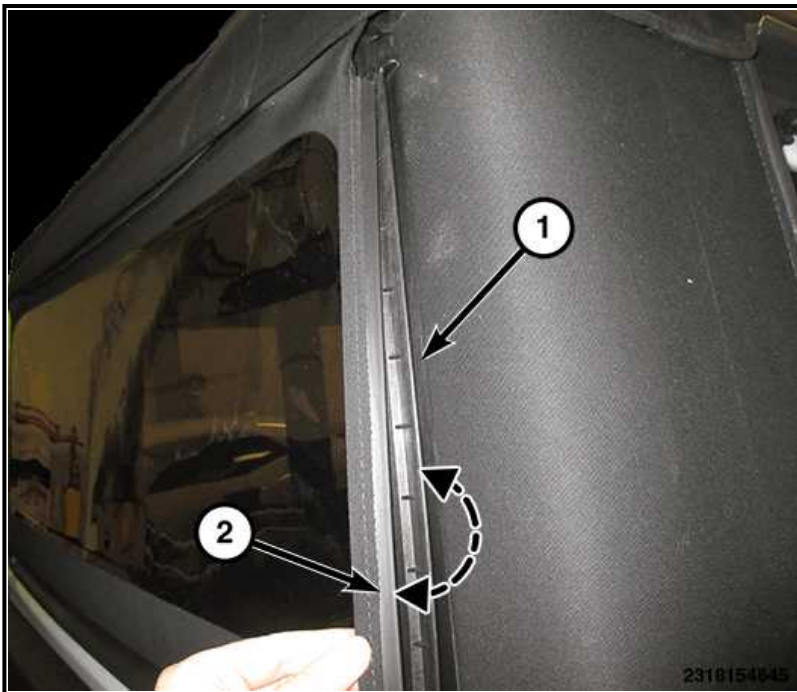


REMOVAL

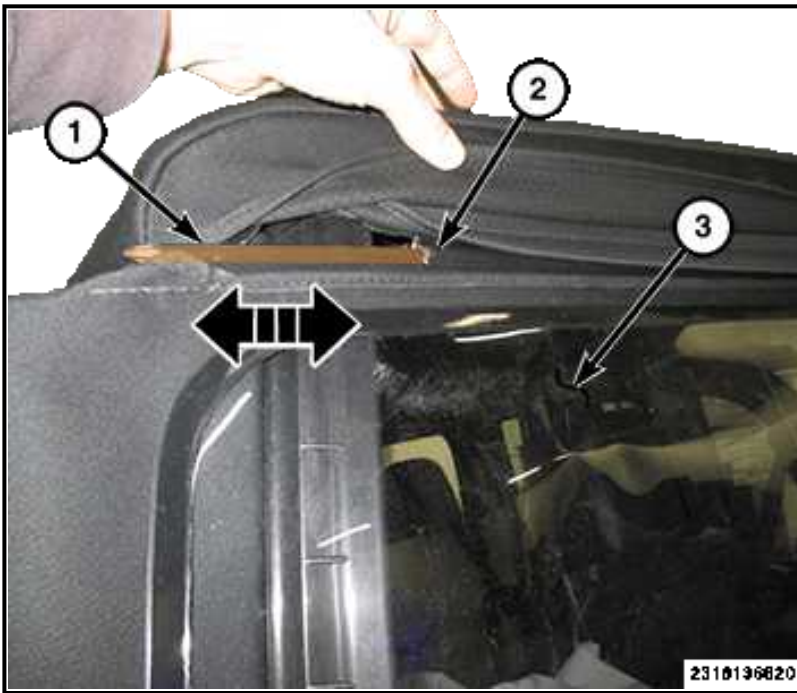
1. Release the rear window lower corner tabs (1) from the quarter panels (2).



2. Release the rear window lower tab (1) from the center body retainer channel (2).



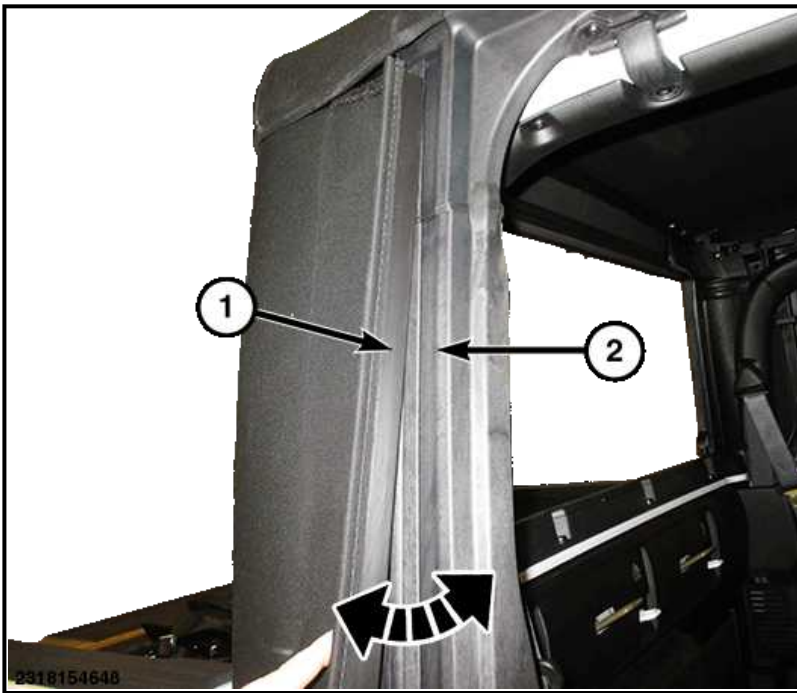
3. Release the side tabs (2) and release the rear window from the channels in the quarter panels (1).



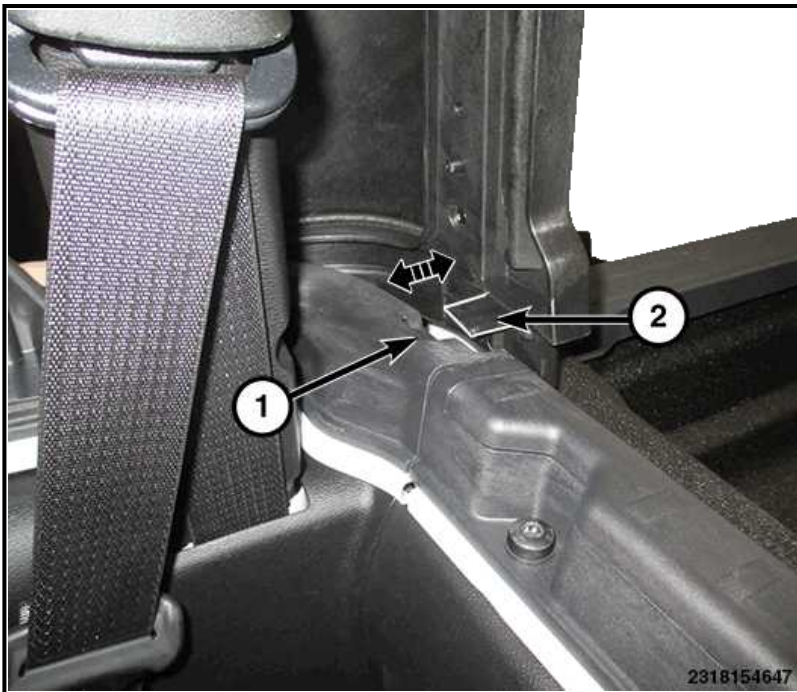
4. While keeping the rear window (3) level, slide to the left until it is completely separate from its retainer (2). Do not pull downward while removing the rear window. Damage to the retainer could result.



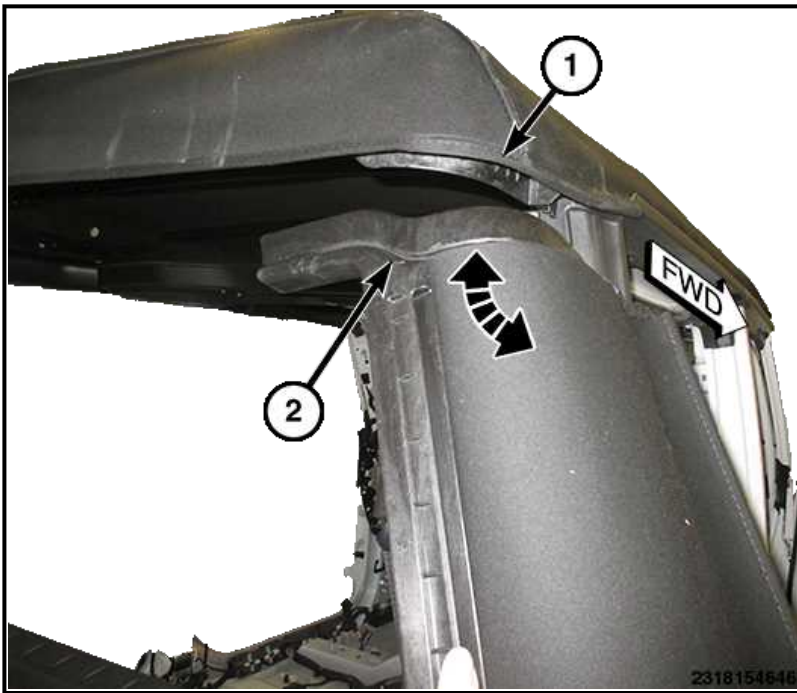
5. Release the Velcro (1) on each of the upper quarter trim panels.



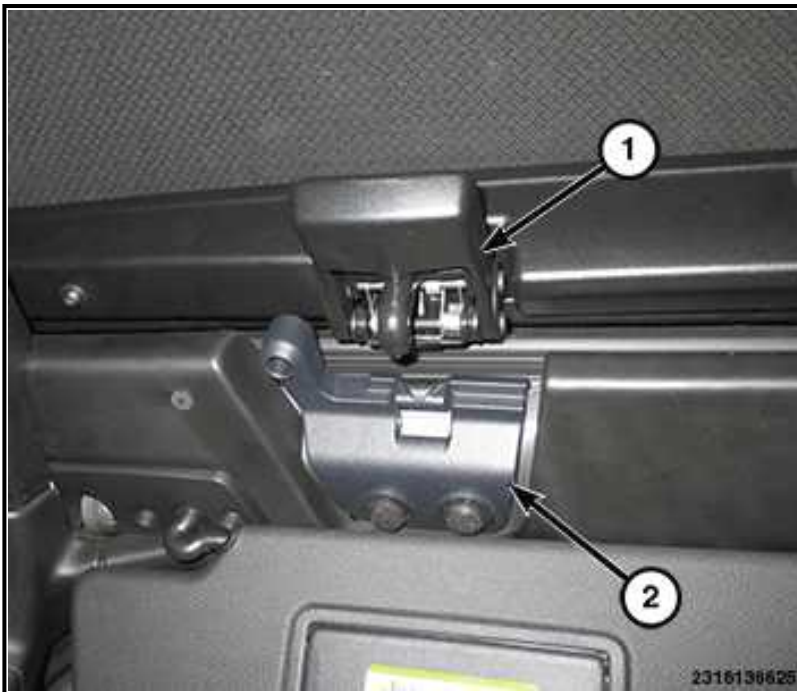
6. Release the quarter trim tabs (1) from the rear door rail channels (2).



7. Separate the lower quarter trim panels tabs (2) from the corner body retainers (1).

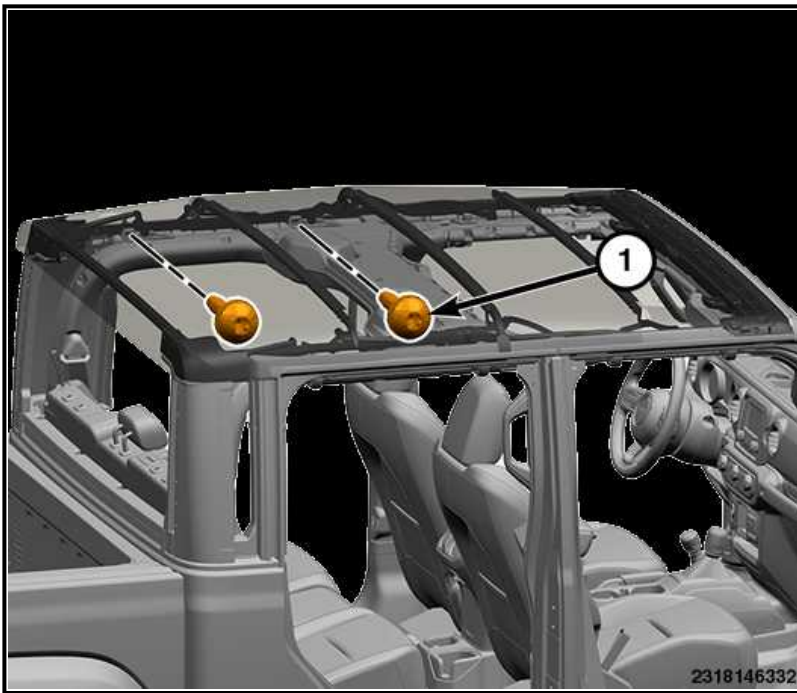


8. Release the upper quarter trim panels (2) from the bow brackets (1) and remove the quarter trim panels.

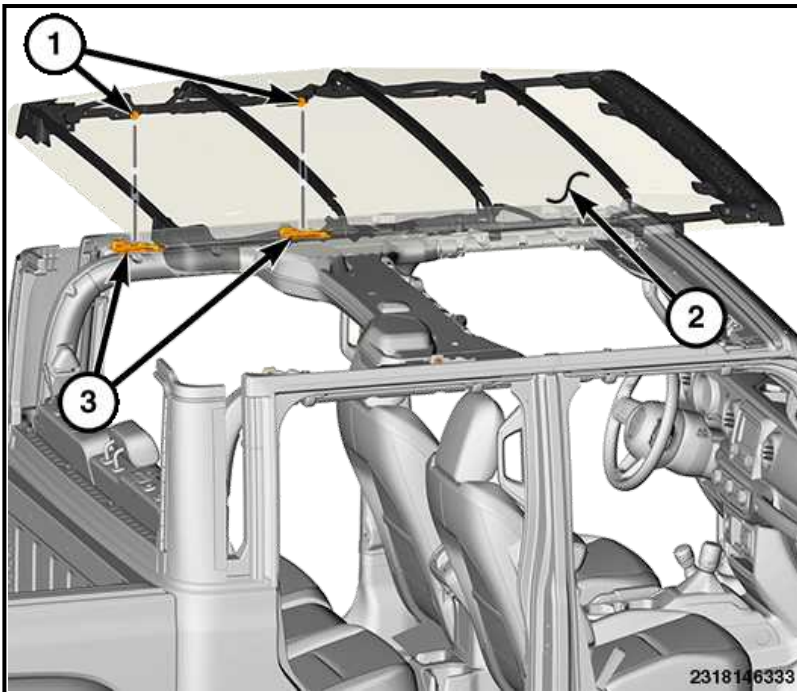


9. Release the header latches (1) from the crossbar (2) by pulling the handle downward. Make sure the hook is disengaged from its receiver.

10. From both the driver and passenger sides, lift up on the #1 Bow of the soft top and pull back to the full open position.

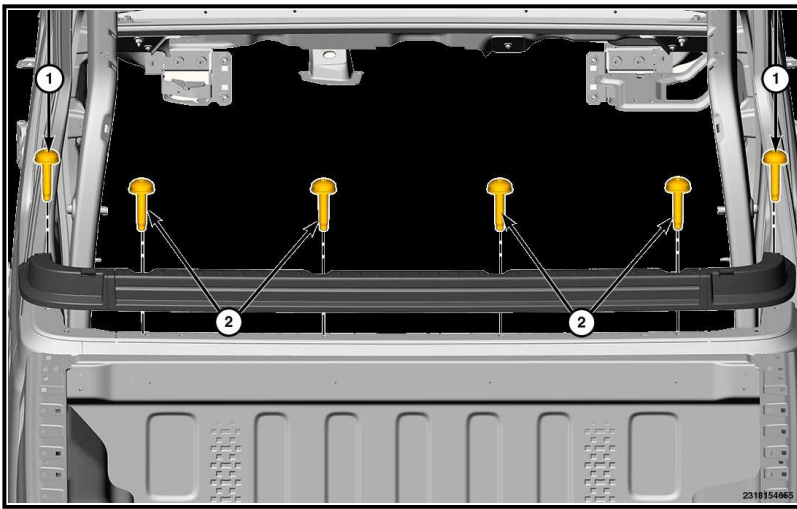


11. Remove the two mounting bolts (1) from each side of the soft top linkages.

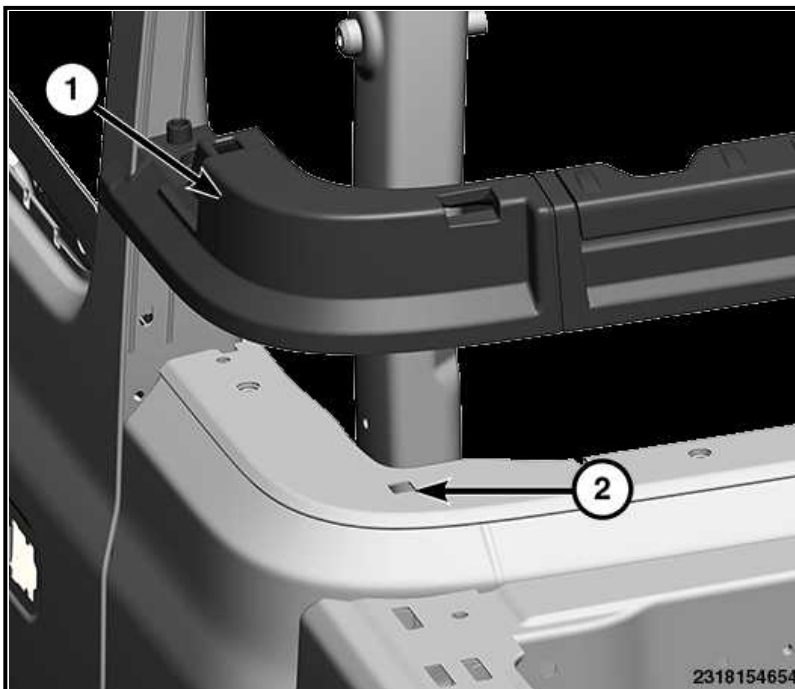


12. Remove the soft top (2) from the vehicle and store in a clean, dry location (another person may be needed to help with this operation).

NOTE: If you are doing this alone, use one arm to hold the bundle up, the other to remove the brackets.

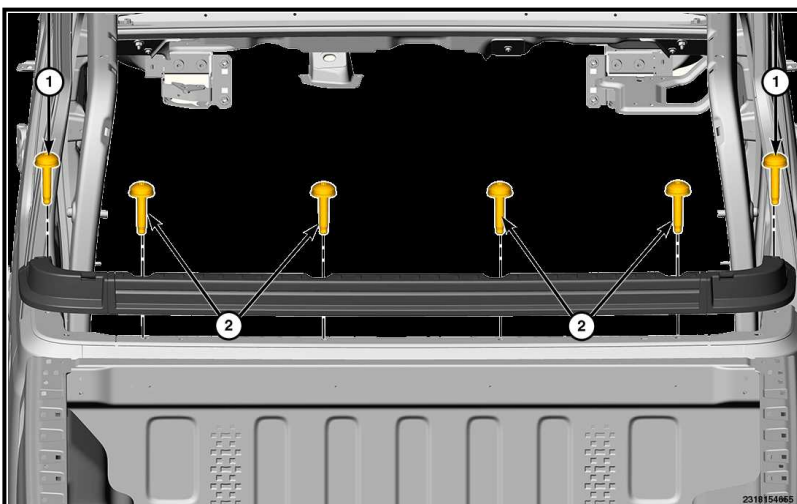


13. If needed, remove the side fasteners (1) and the center fasteners (2) and remove the soft top J-rail assembly.

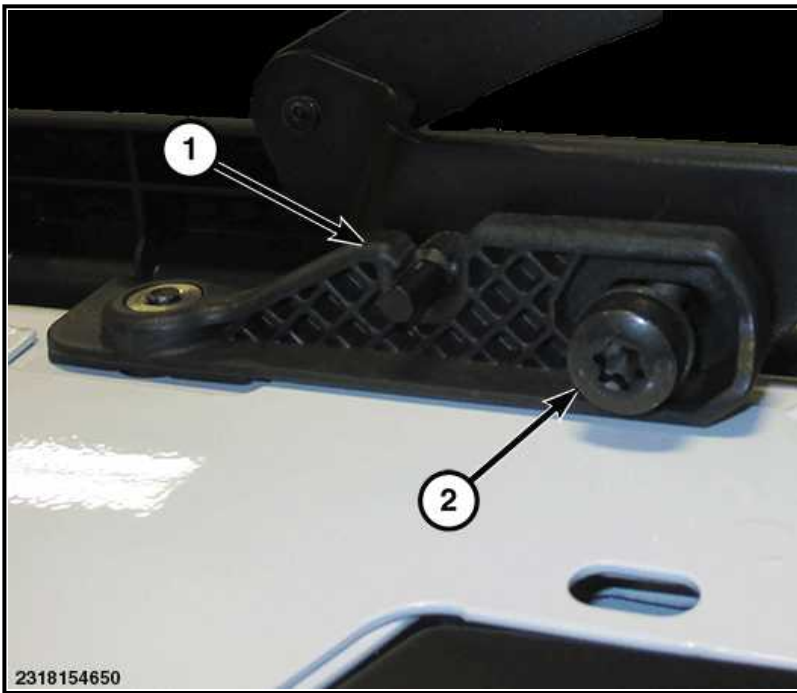


INSTALLATION

1. If needed, install the J-rail assembly (1) and secure the corner guide pins into the slot (2).



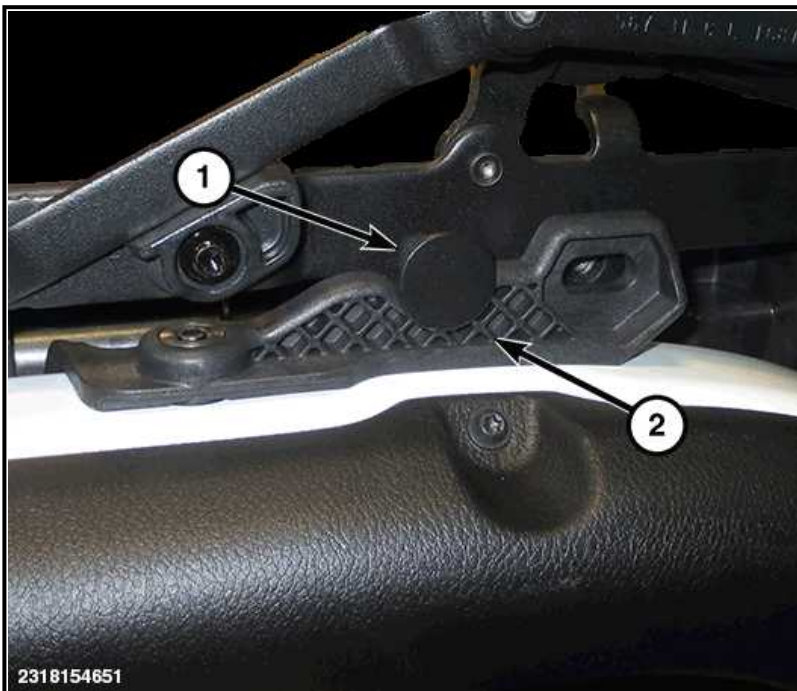
2. Install the center fasteners (2) and the side fasteners (1) and tighten to the proper Refer to **TORQUE SPECIFICATIONS** .



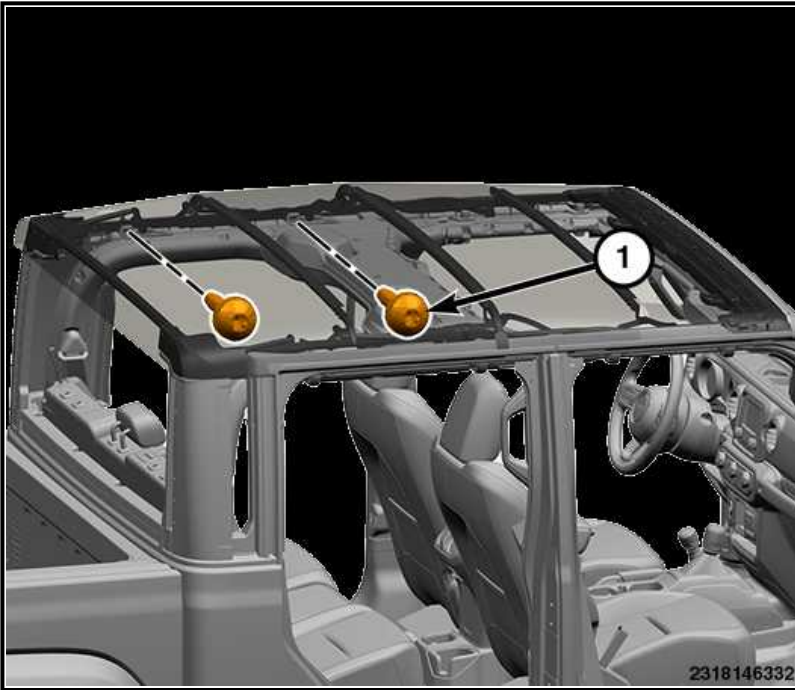
3. Lower the linkage assembly studs (1) to the retainers on both sides (on the inside of the sport bar) and slide inward to engage into the bracket.

NOTE: If you are doing this alone, use one arm to hold the soft top up, the other to align the brackets.

4. Loosely install the front bolts (2).



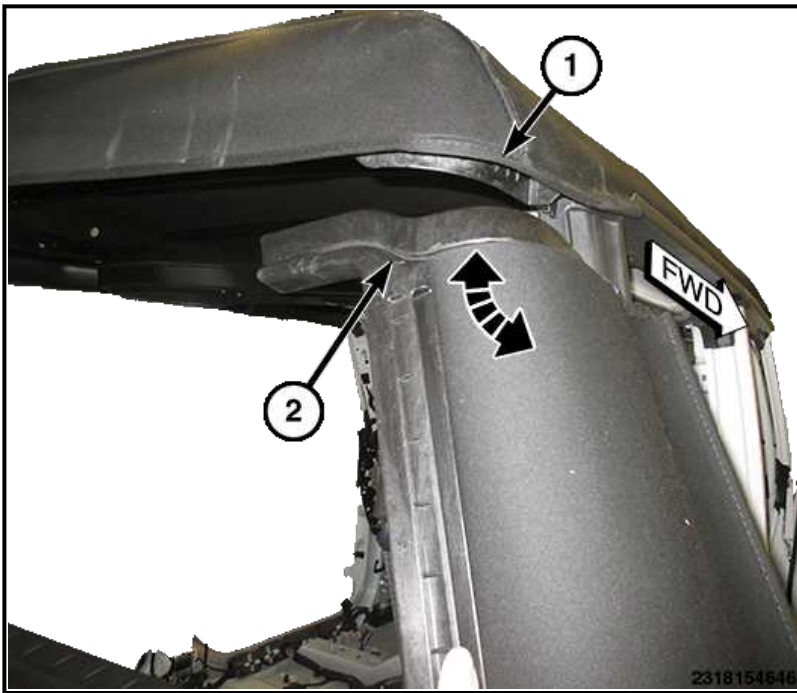
5. Make sure the rear studs (1) are seated into the rear door rail brackets (2) fully.



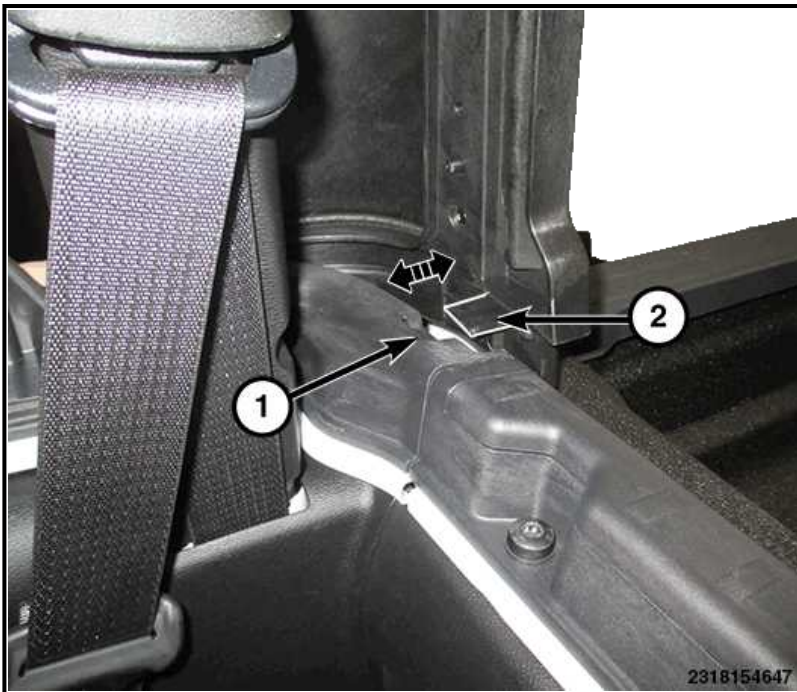
6. Install the remaining screws (1) and using a #40 Torx head driver and ratchet, tighten the Torx screws (1) to the proper, being careful not to cross-thread the screws or overtighten. Refer to [**TORQUE SPECIFICATIONS**](#) . Repeat on the opposite side.



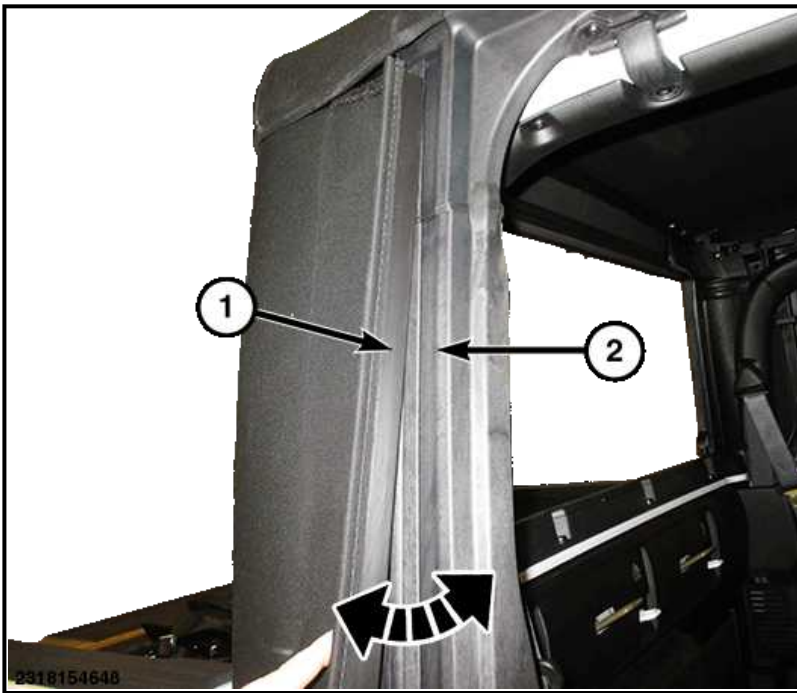
7. From inside the vehicle, pull the handle (1) on the header latch downward to engage the hook into its receiver (2). Repeat on the other side.
8. Pull the handle (1) back upward while squeezing the hook, locking the latch into place.



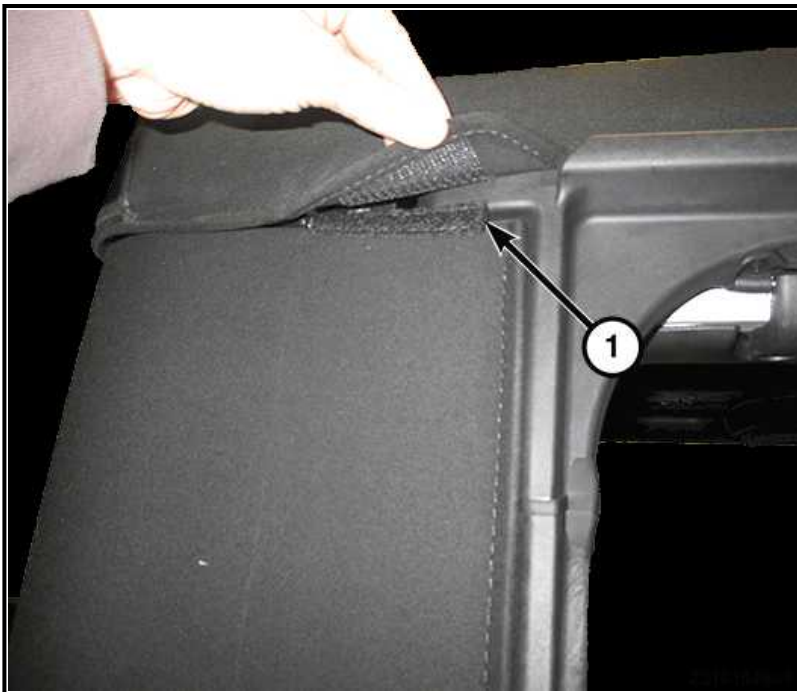
9. Guide the upper quarter trim panel (2) into the bow brackets (1) and seat fully.



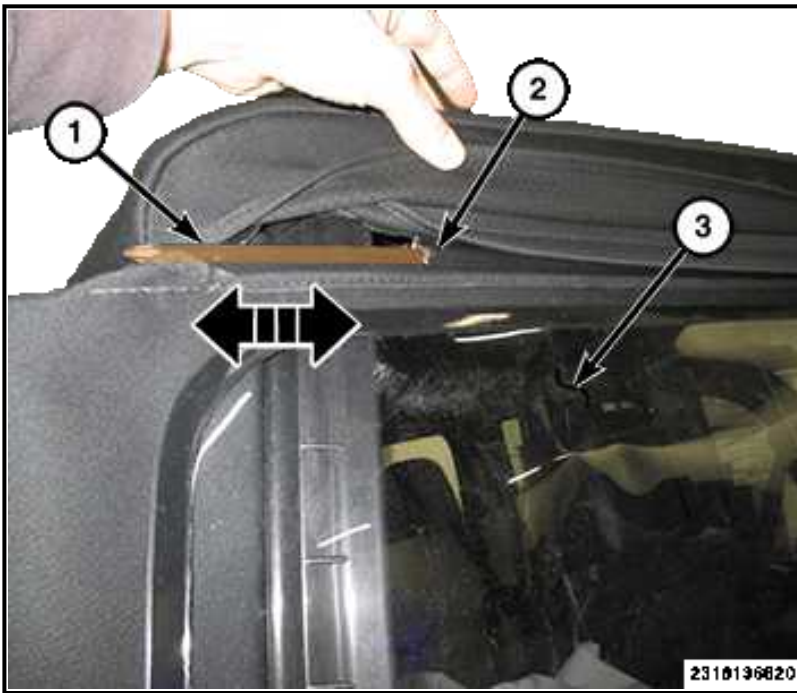
10. Insert the lower quarter trim panel tab (2) into the slot of the corner body retainer (1) and seat the quarter trim fully.



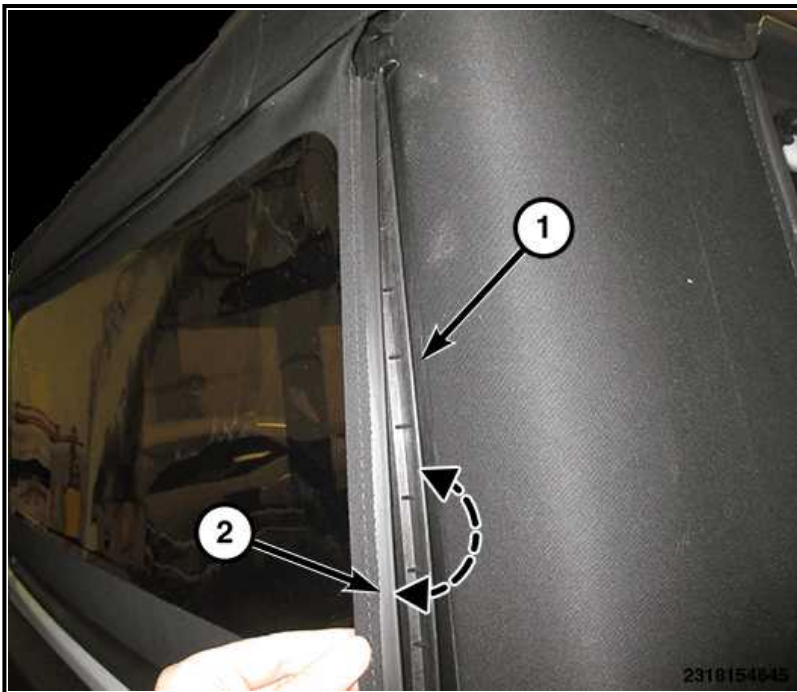
11. Secure the quarter trim tabs (1) into the rear door rail channels (2).



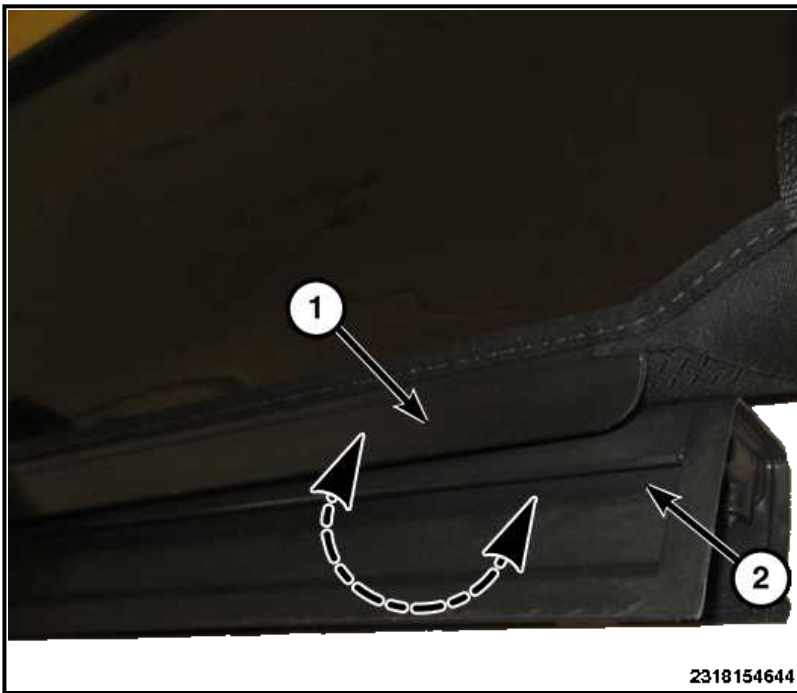
12. Seat the Velcro (1) fully and repeat the steps for the quarter trim on the other side of the vehicle.



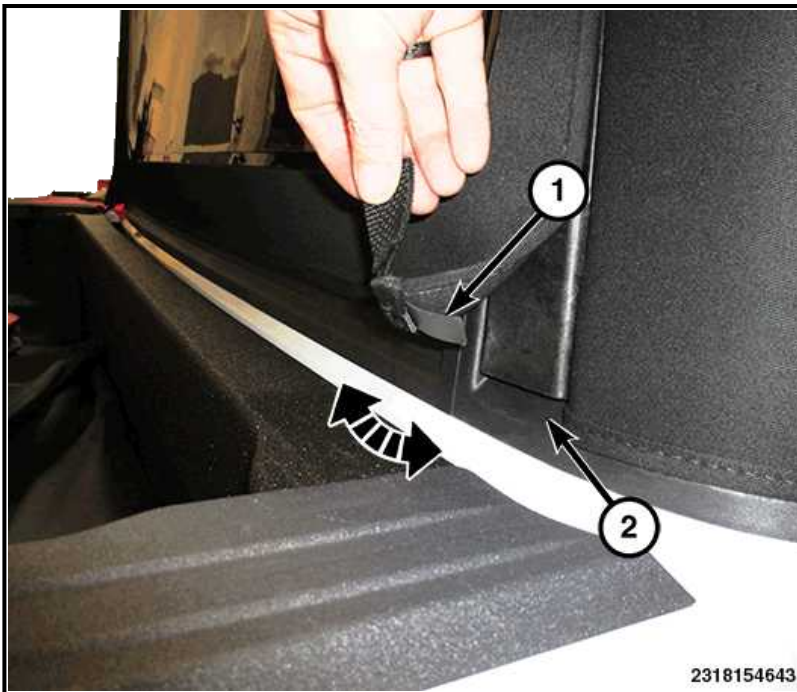
13. Guide the rear window (1) into the retainer (2) from left to right while keeping the window (3) level.



14. Secure the side tabs (2) into the quarter trim channels (1).



15. Secure the lower tab (1) into the center body retainer channel (2).



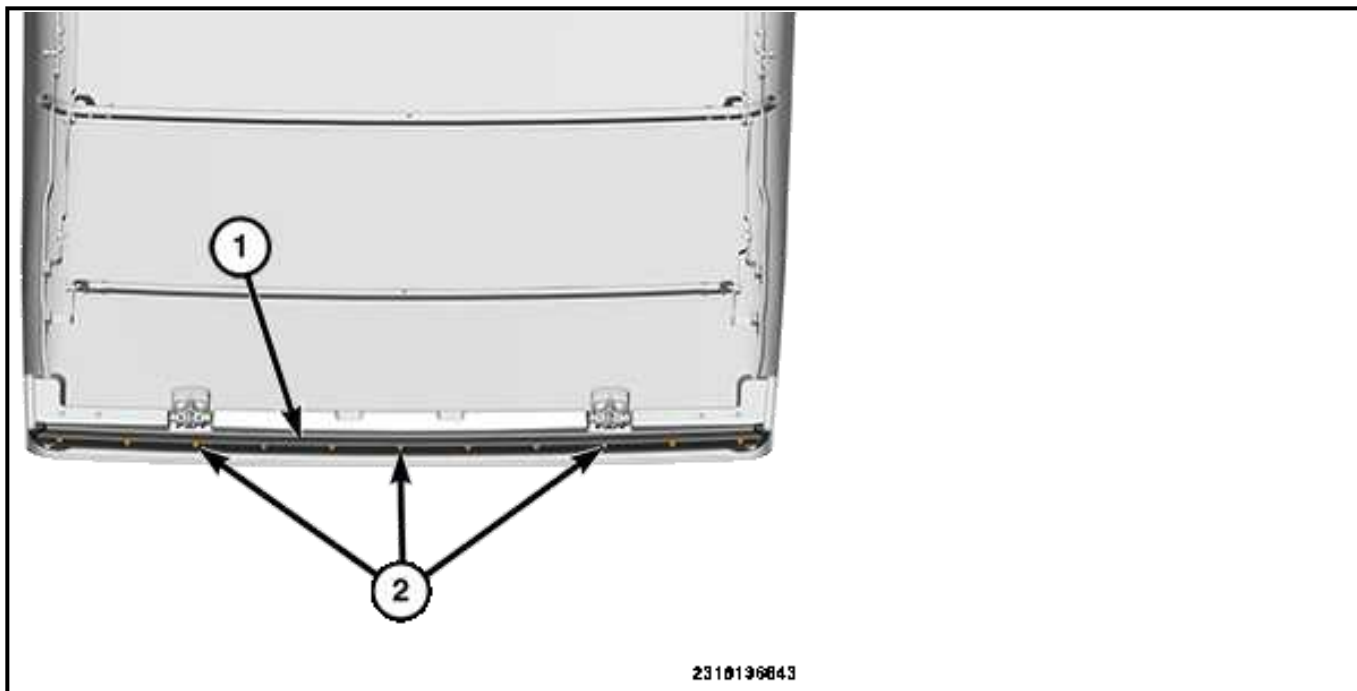
16. Secure the lower corner tabs (1) into the lower quarter trim channels (2).

17. Make sure the sides of the top fabric are seated into the upper door rails.

BOW, ASSEMBLY, NUMBER 1

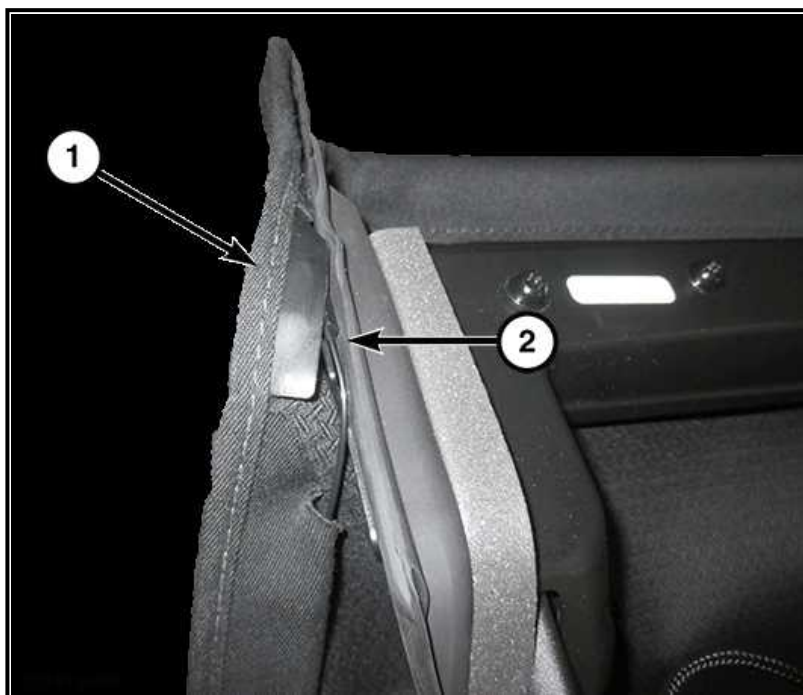
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

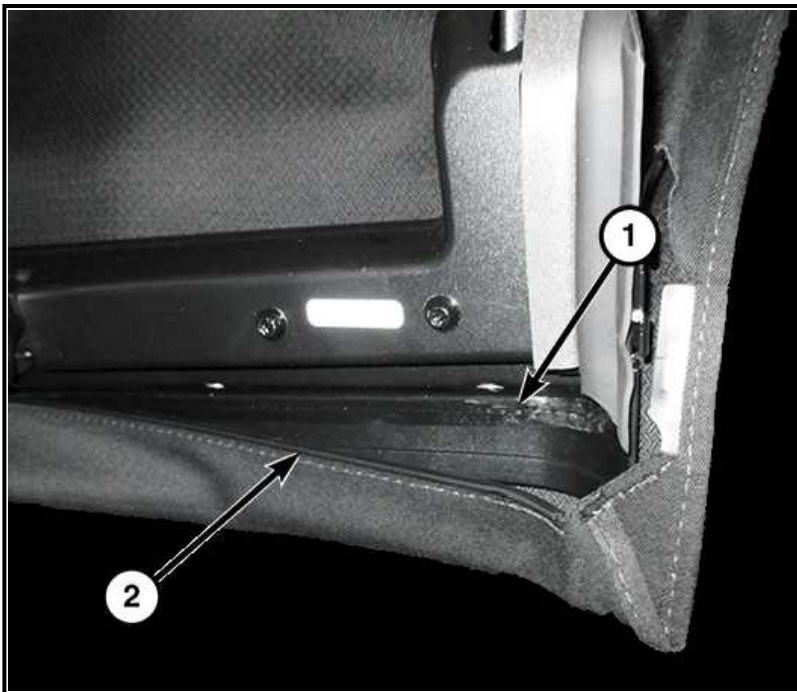
1. Position the top into the full open position, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the screws (2) and the compression panel (1).



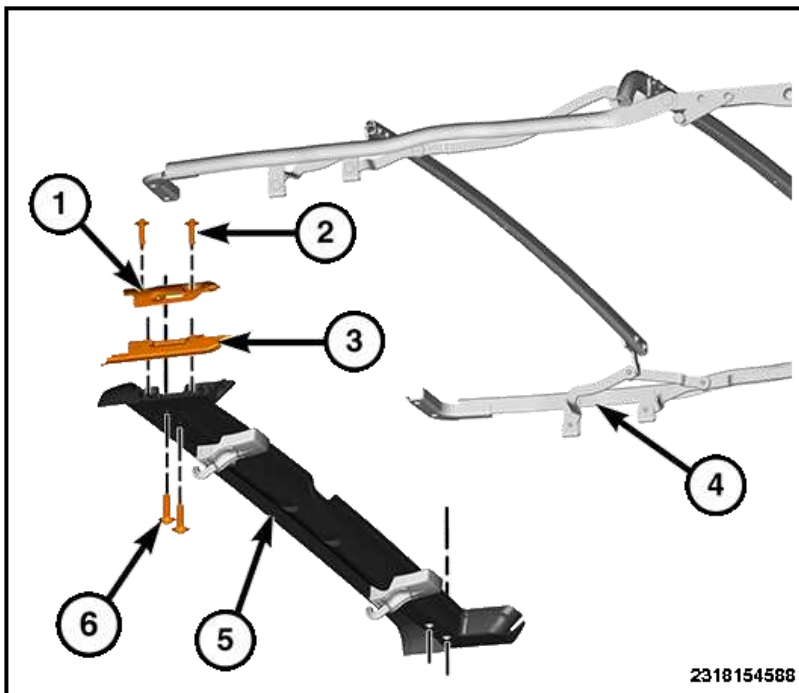
3. Release the cover tabs (1) from the seal brackets (2).



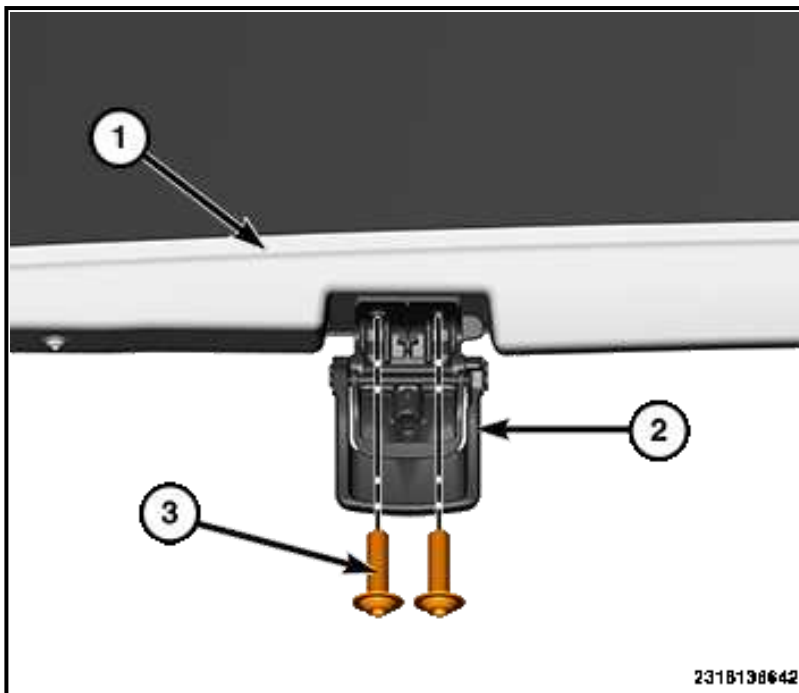
4. Disconnect the cables (1) from the seal brackets.



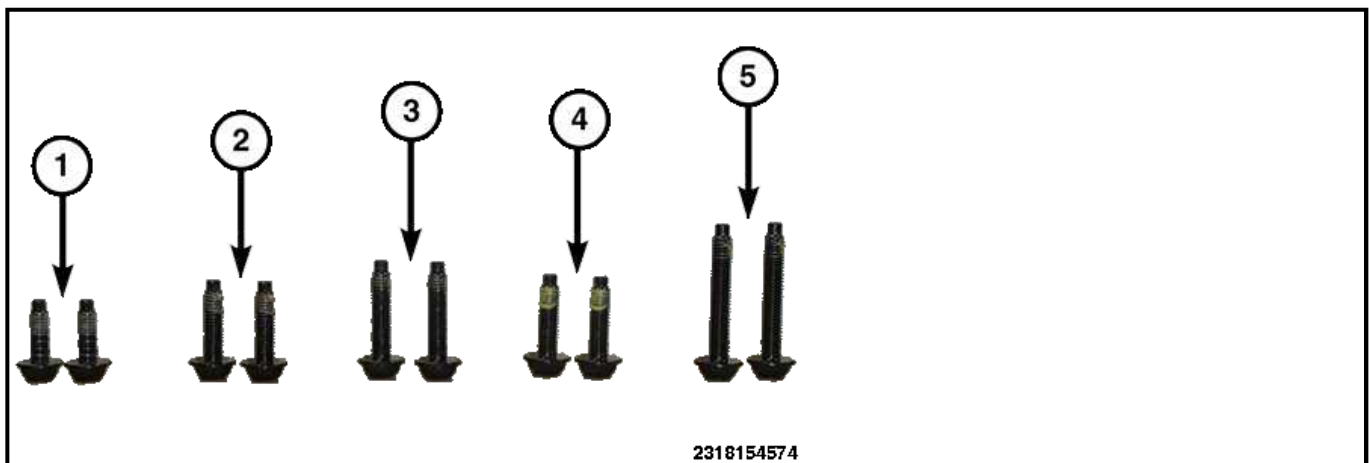
5. Release the cover (2) from the two sided tape (1) on the bow.



6. Remove the four fasteners (6) and separate the bow assembly (5) from the linkage assembly (4).
7. Remove the fasteners (2) and remove the cable brackets (1) and the seals (3) from the bow assembly.

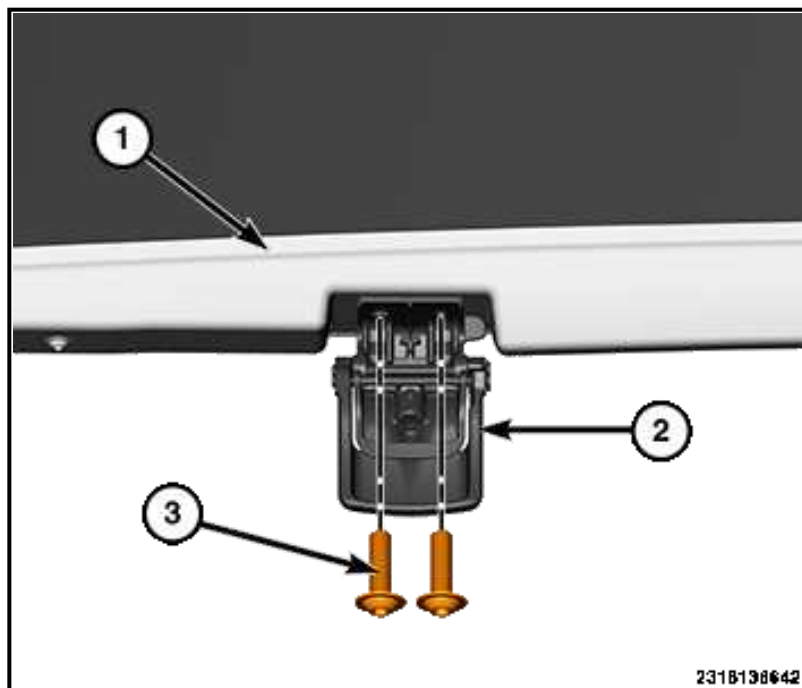


8. Remove the screws (3) and remove the latches (2) from the bow (1).



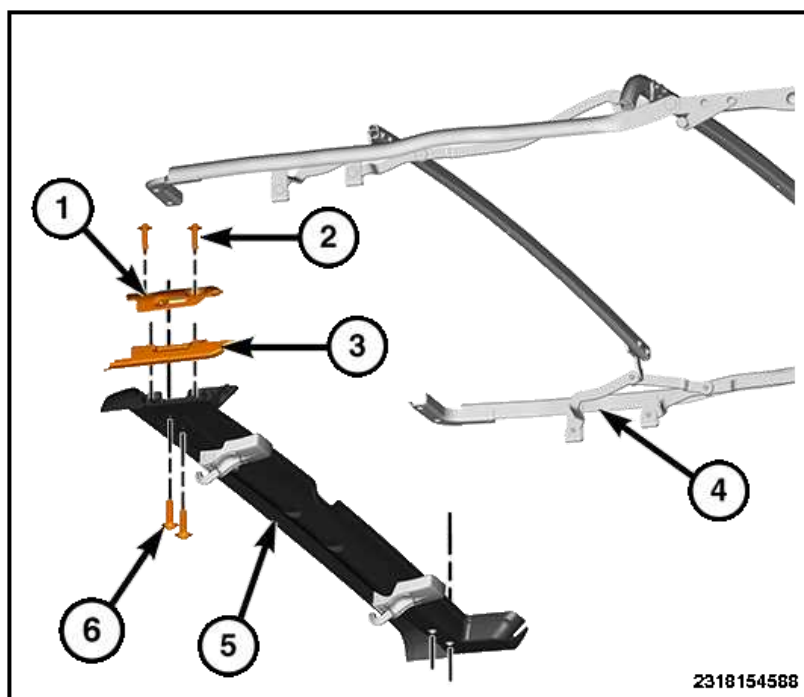
1. BOW #1
2. BOW #2
3. BOW #3
4. BOW #4
5. BOW #5

NOTE: Each bow has unique fastener lengths. Refer to the illustration for correct fastener locations.



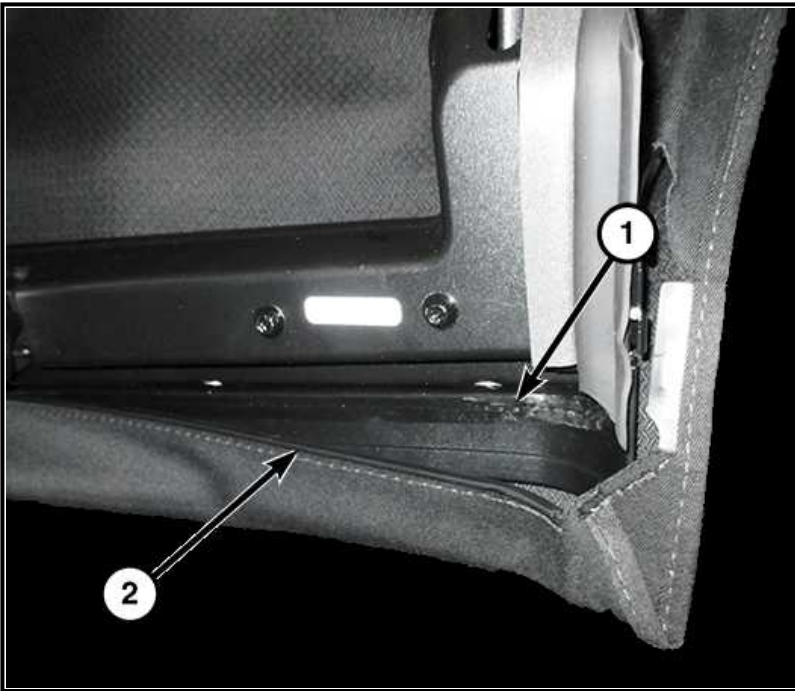
INSTALLATION

1. Install the latch (2) on the bow (1) and install the screws (3).



2. Install the seals (3) and the cable brackets (1) on the bow assembly (5) and install the fasteners (2).
3. Tighten the cable bracket fasteners (2) to the proper Refer to [TORQUE SPECIFICATIONS](#) .
4. Install the #1 bow assembly (5) on the linkage assembly (4) and install the four fasteners (6).

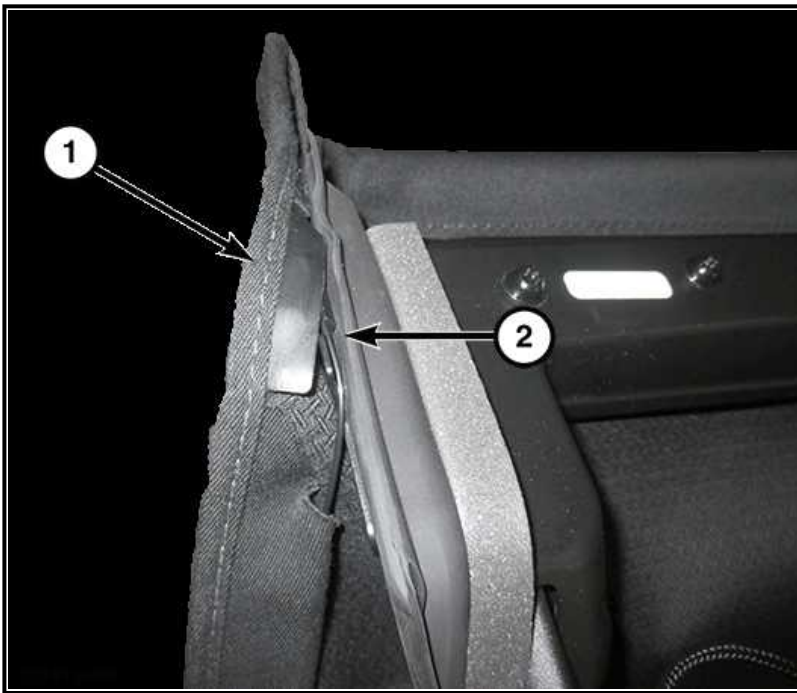
5. Tighten the #1 bow to linkage fasteners (6) to the proper Refer to [TORQUE SPECIFICATIONS](#) .



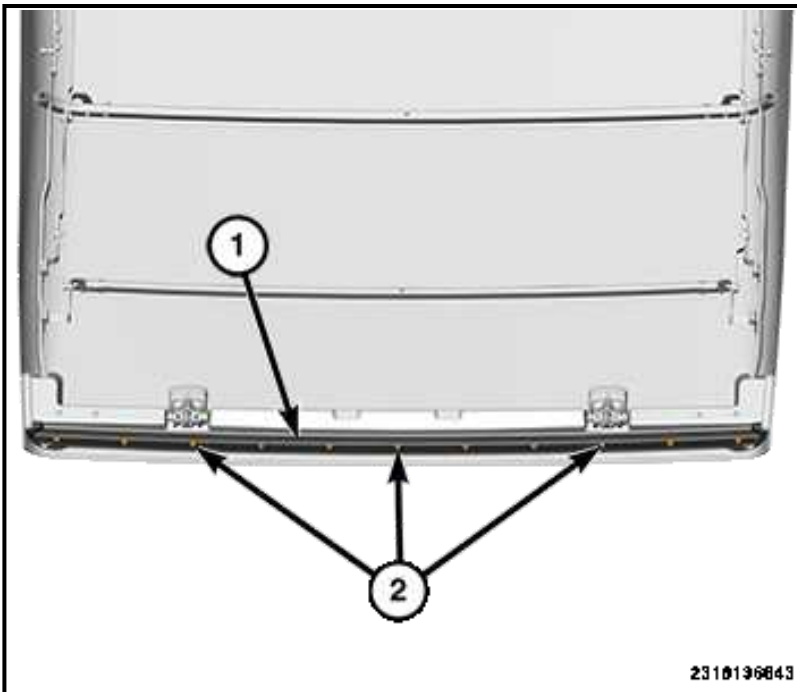
6. Position the cover (2) on the bow and seat into the two sided tape (1) fully.



7. Connect the cables (1) into the seal brackets.



8. Secure the cover tabs (1) into the seal brackets (2) on each side.



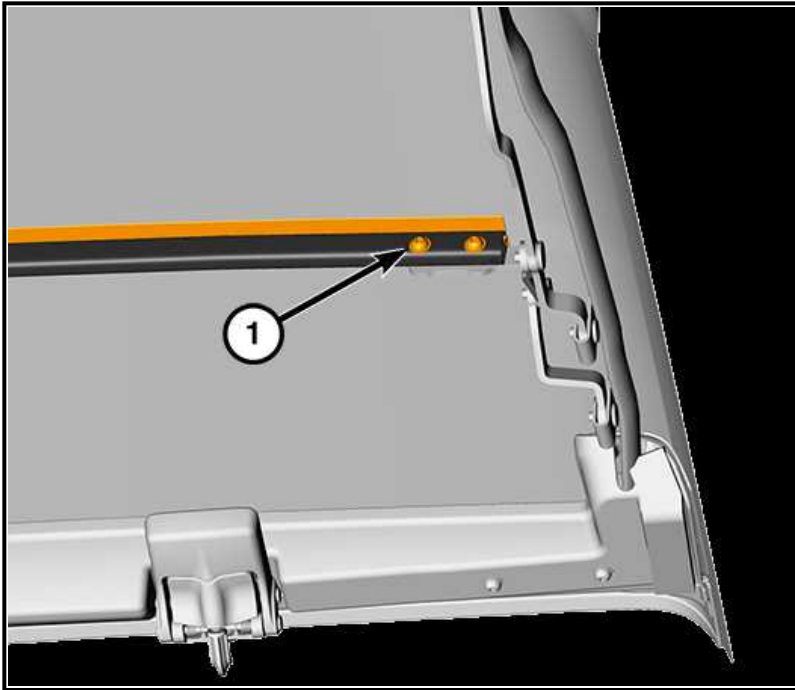
9. Install the compression panel (1) and install the screws (2) securely.

10. Close the top, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

BOW, ASSEMBLY, NUMBER 2

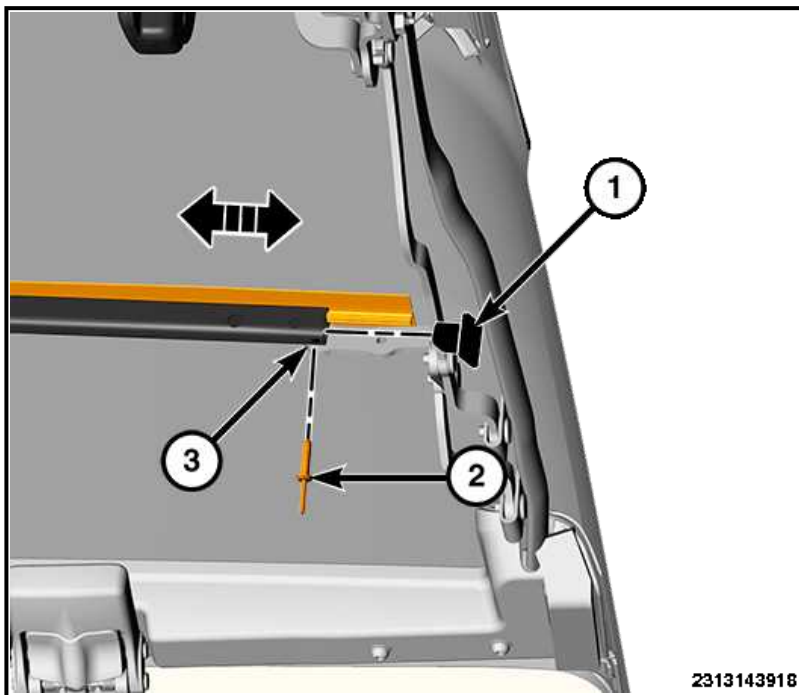
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

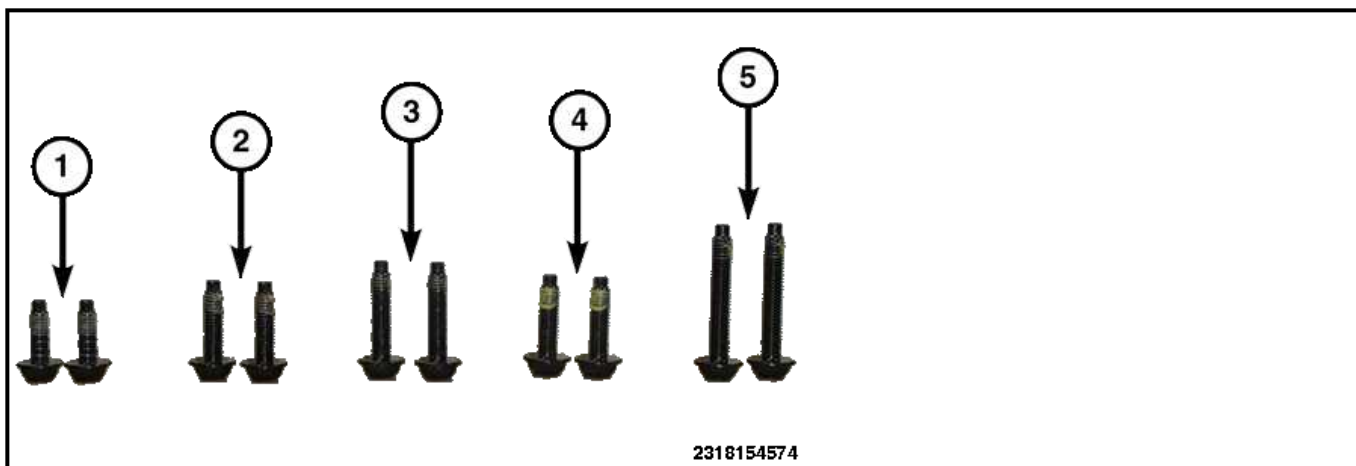


REMOVAL

1. Position the top into the full open position, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the screws (1) attaching the bow to the linkage assemblies.

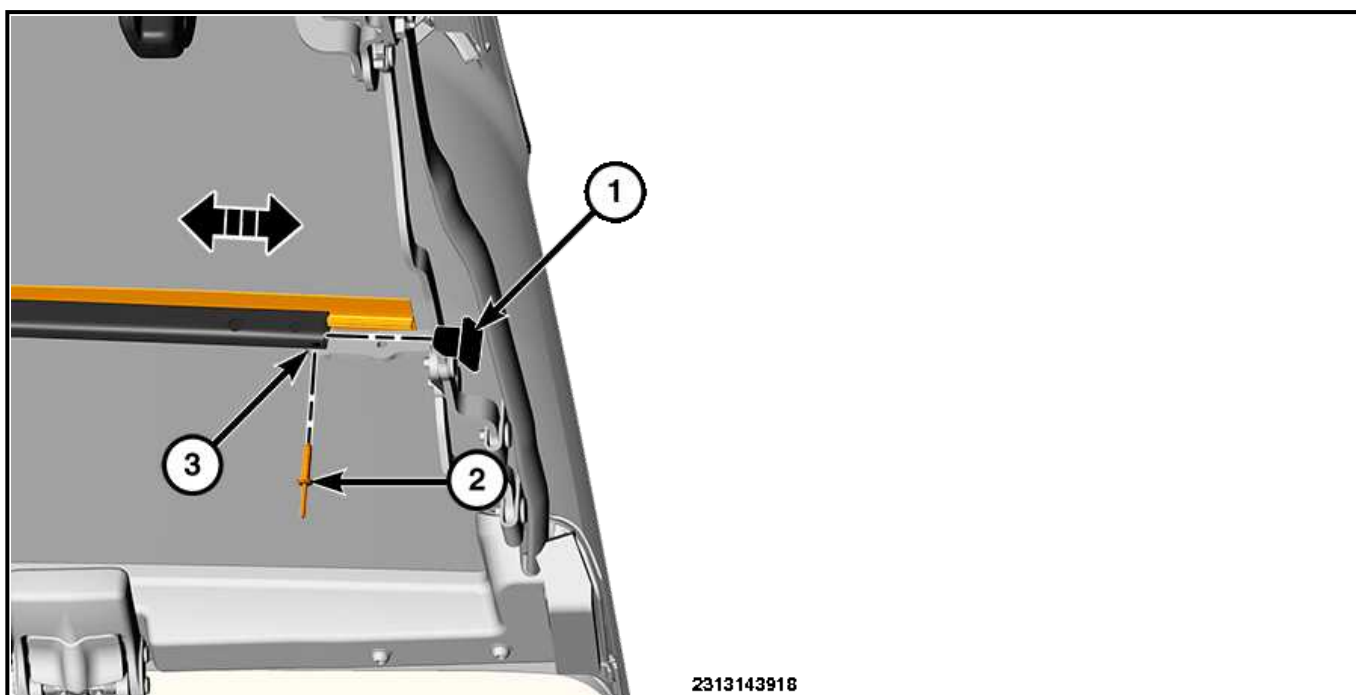


3. Remove the rivets (2) and remove the end caps (1) from one side of the bow.
4. Slide the bow (3) off the soft top support bead and remove the bow.



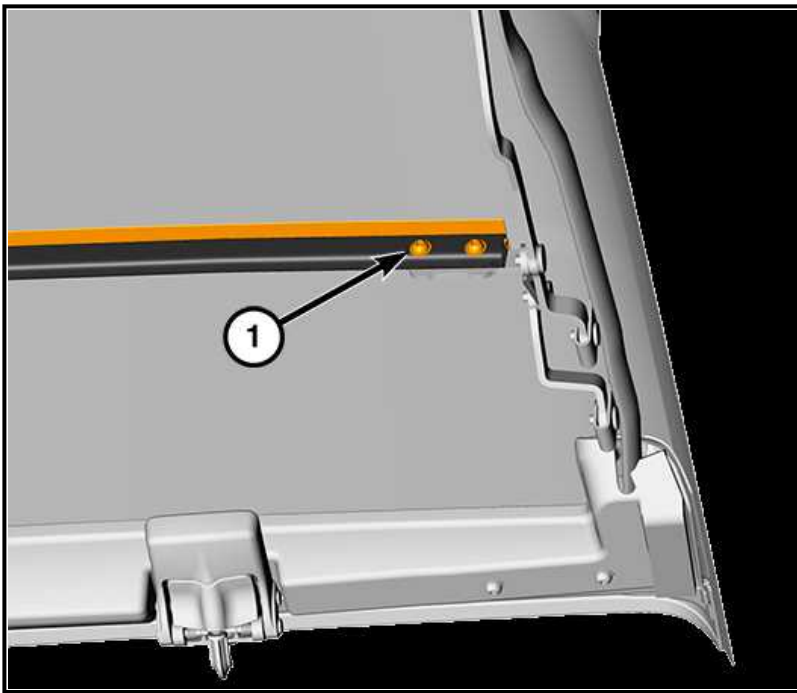
1. BOW #1
2. BOW #2
3. BOW #3
4. BOW #4
5. BOW #5

NOTE: Each bow has unique fastener lengths. Refer to the illustration for correct fastener locations.



INSTALLATION

1. Slide the bow (3) on the soft top support bead.
2. Install the end cap (1) and install new rivets (2).

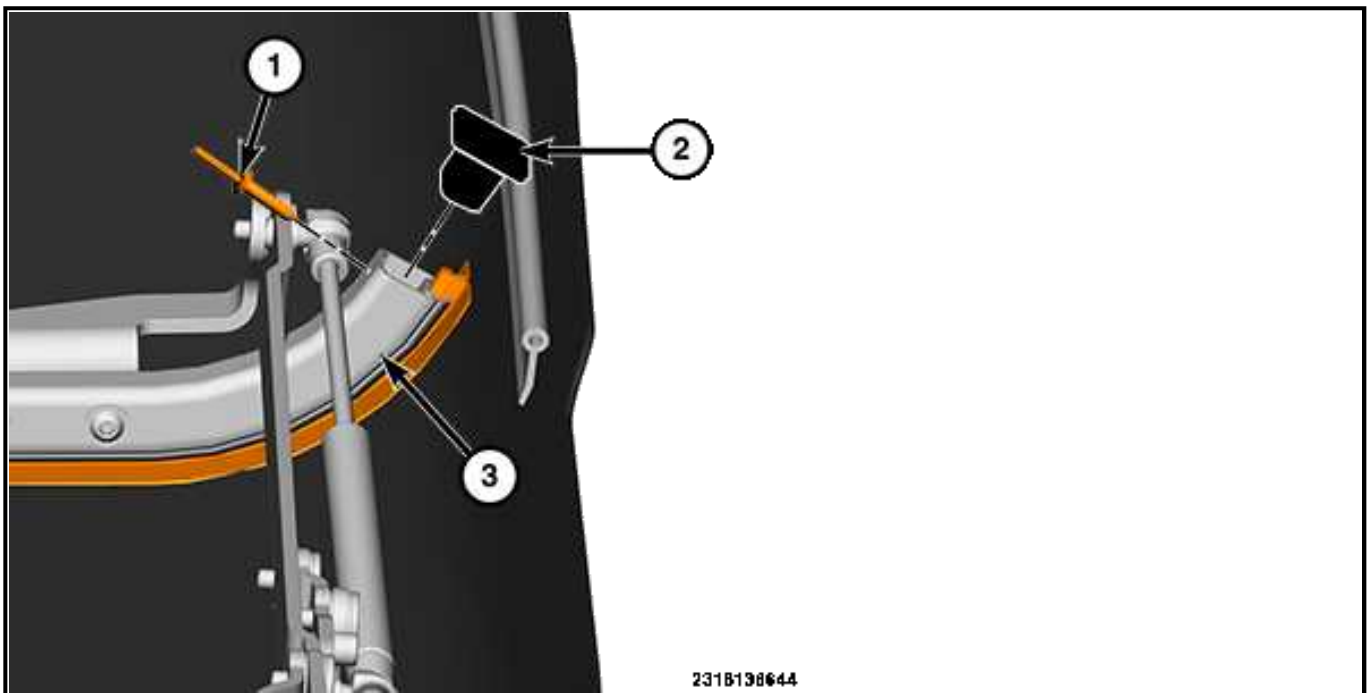


3. Install the screws (1) securing the bow to the linkage assembly.
4. Close the top, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

BOW, ASSEMBLY, NUMBER 3

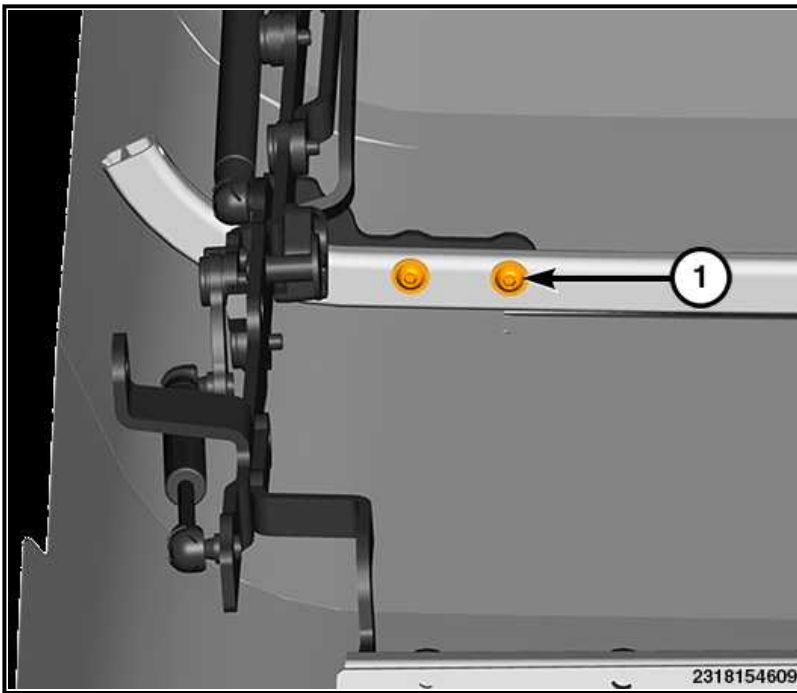
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

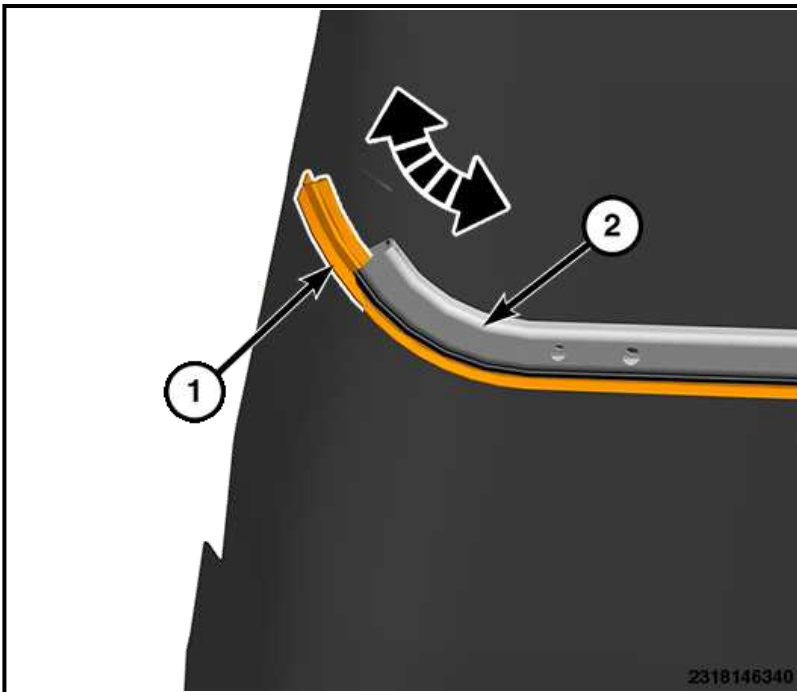


REMOVAL

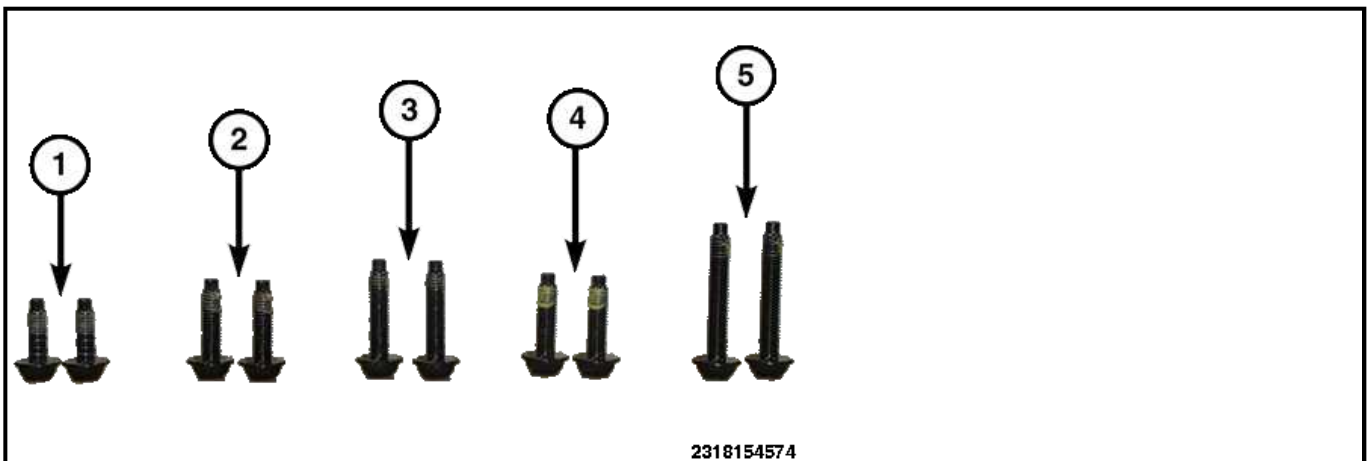
1. Position the top into the full open position, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the rivets (1) and remove the end caps (2).



3. Remove the screws (1) attaching the bow to the linkage assemblies.

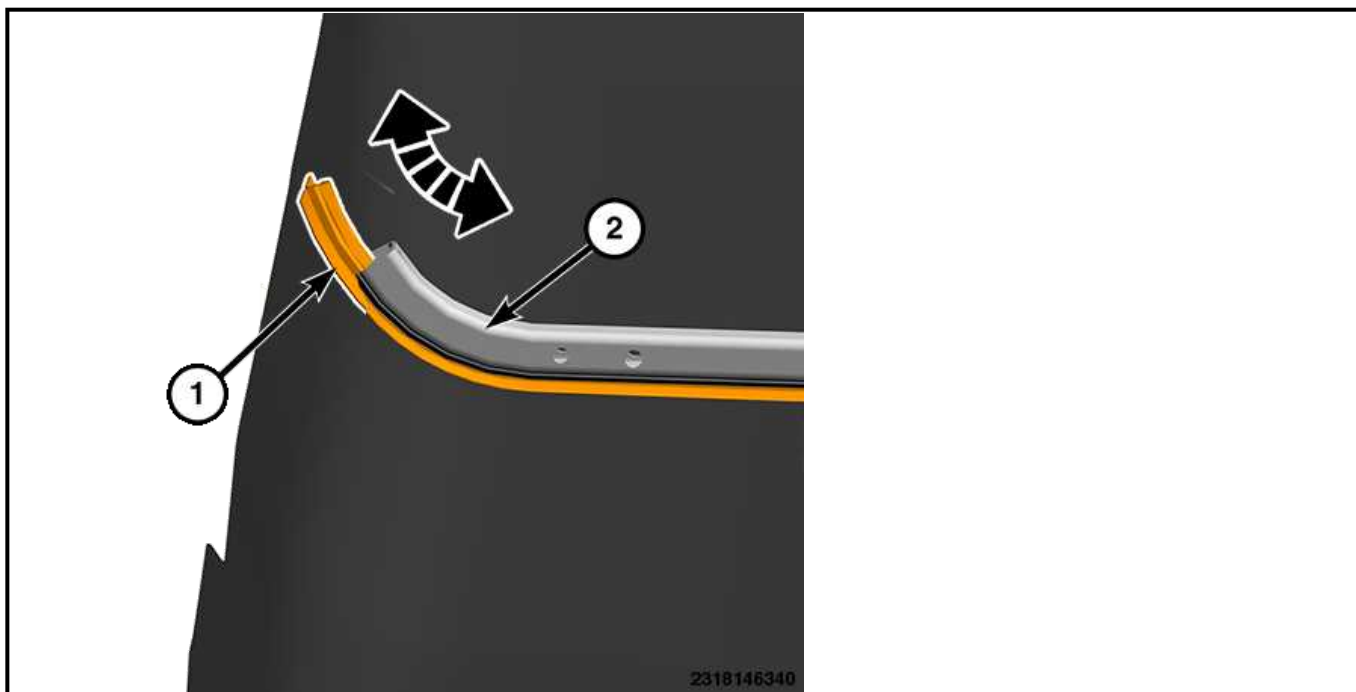


4. Slide the bow (2) off the soft top support bead (1) and remove the bow.



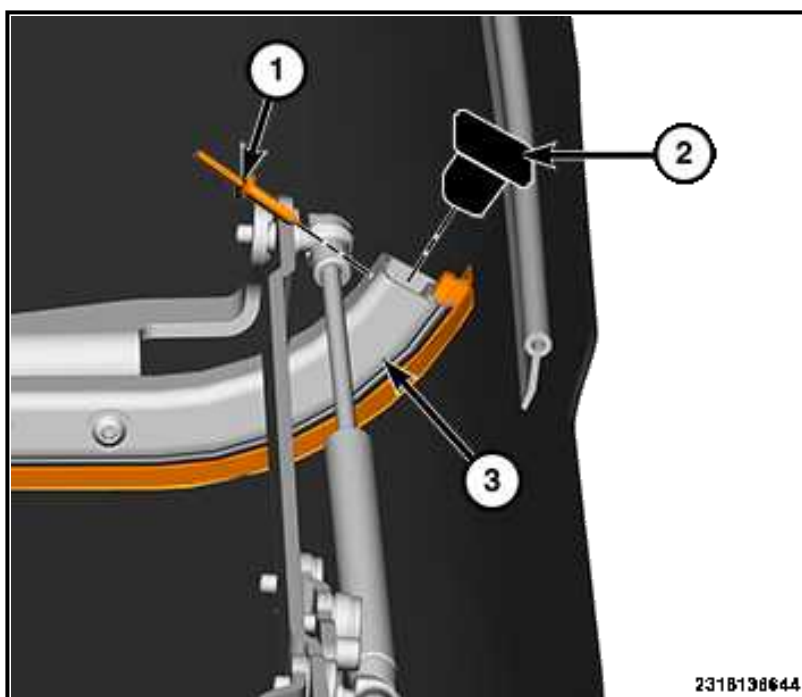
1. BOW #1
2. BOW #2
3. BOW #3
4. BOW #4
5. BOW #5

NOTE: Each bow has unique fastener lengths. Refer to the illustration for correct fastener locations.

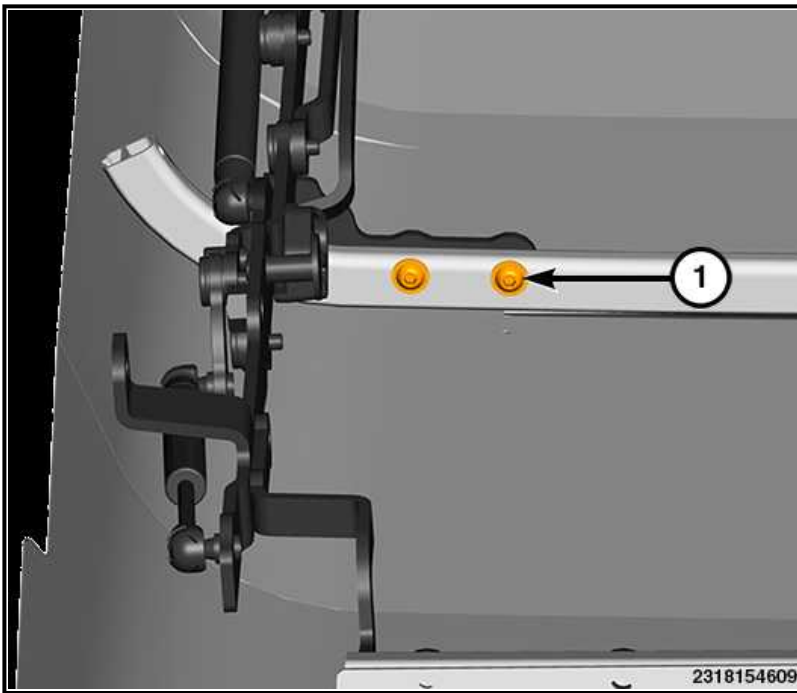


INSTALLATION

1. Slide the bow (2) on the soft top support bead (1).



2. Install the end caps (2) and install new rivets (1).



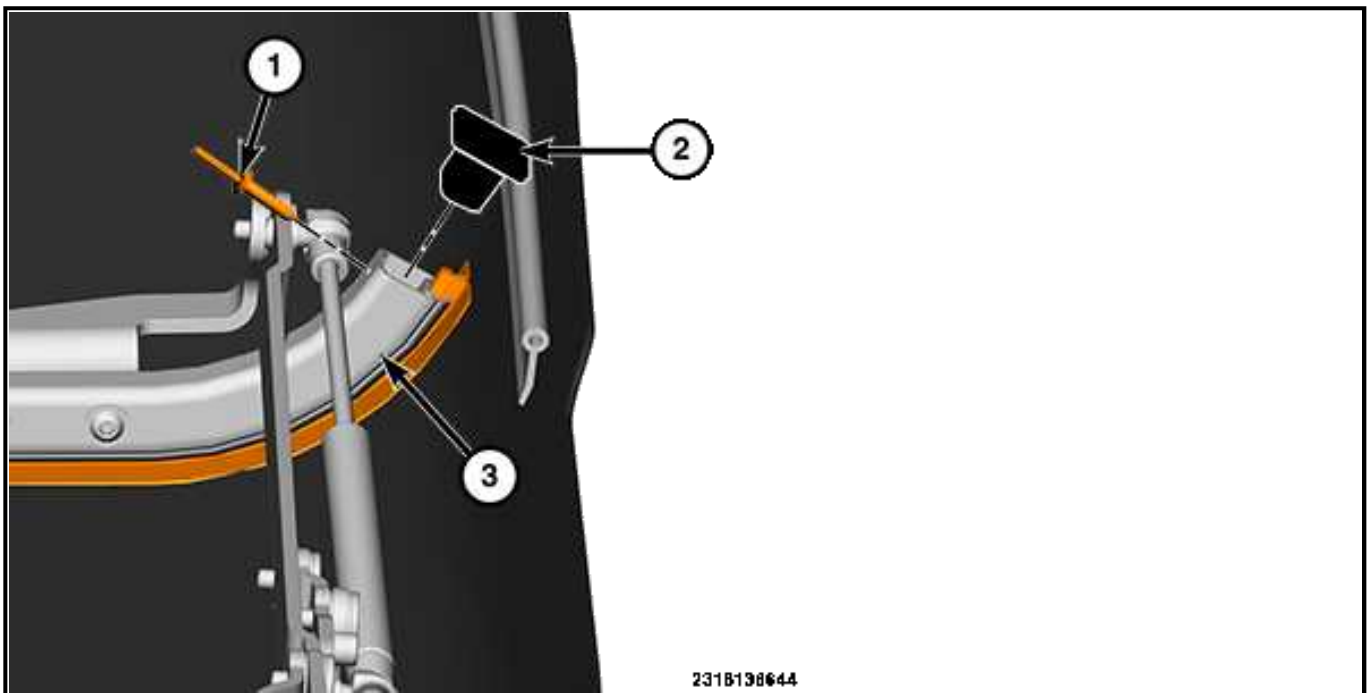
3. Install the fasteners (1).

4. Close the top, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

BOW, ASSEMBLY, NUMBER 4

REMOVAL AND INSTALLATION

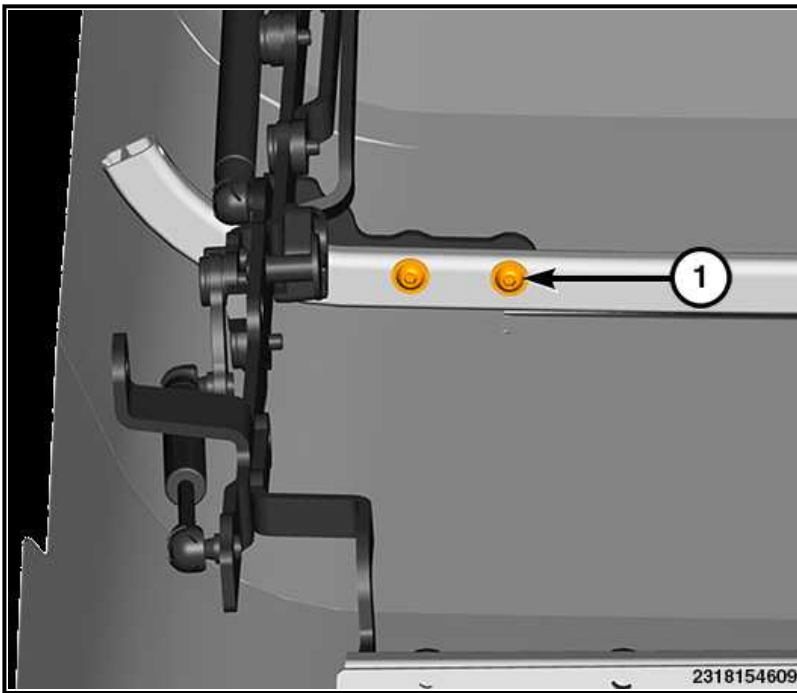
REMOVAL AND INSTALLATION



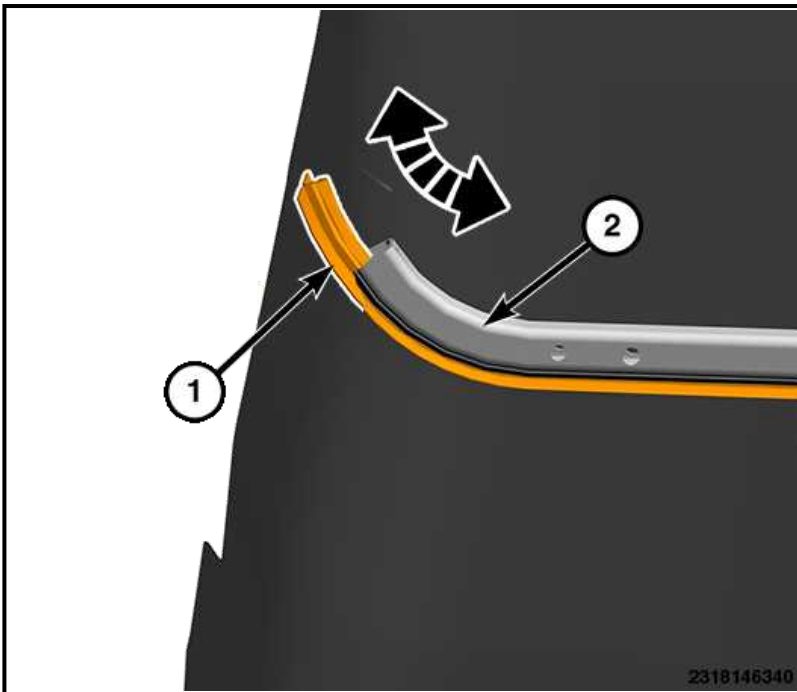
REMOVAL

1. Position the top into the full open position, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

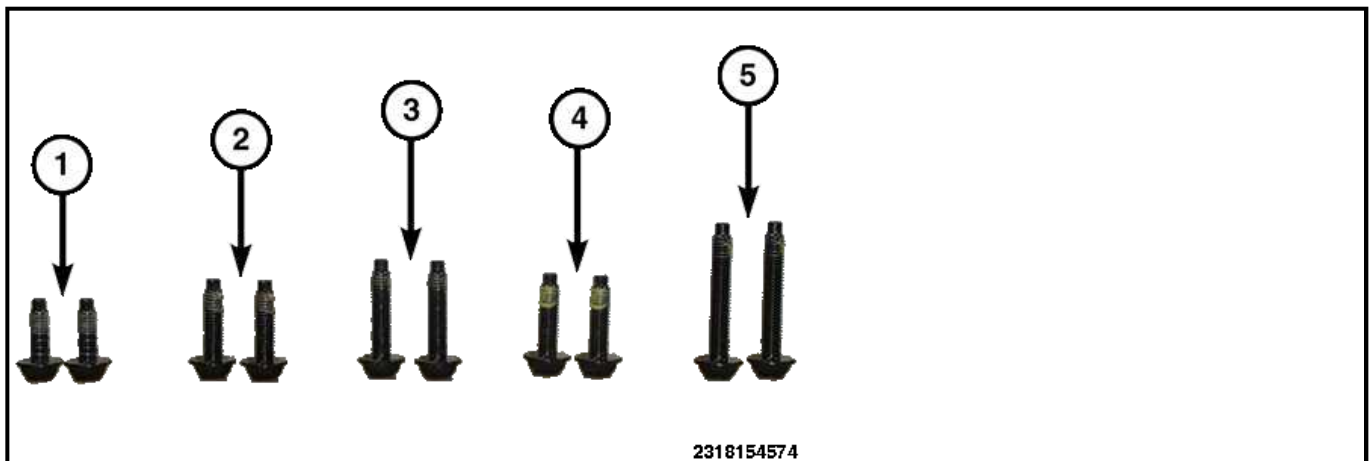
2. Remove the rivets (1) and remove the end caps (2).



3. Remove the screws (1) attaching the bow to the linkage assemblies.

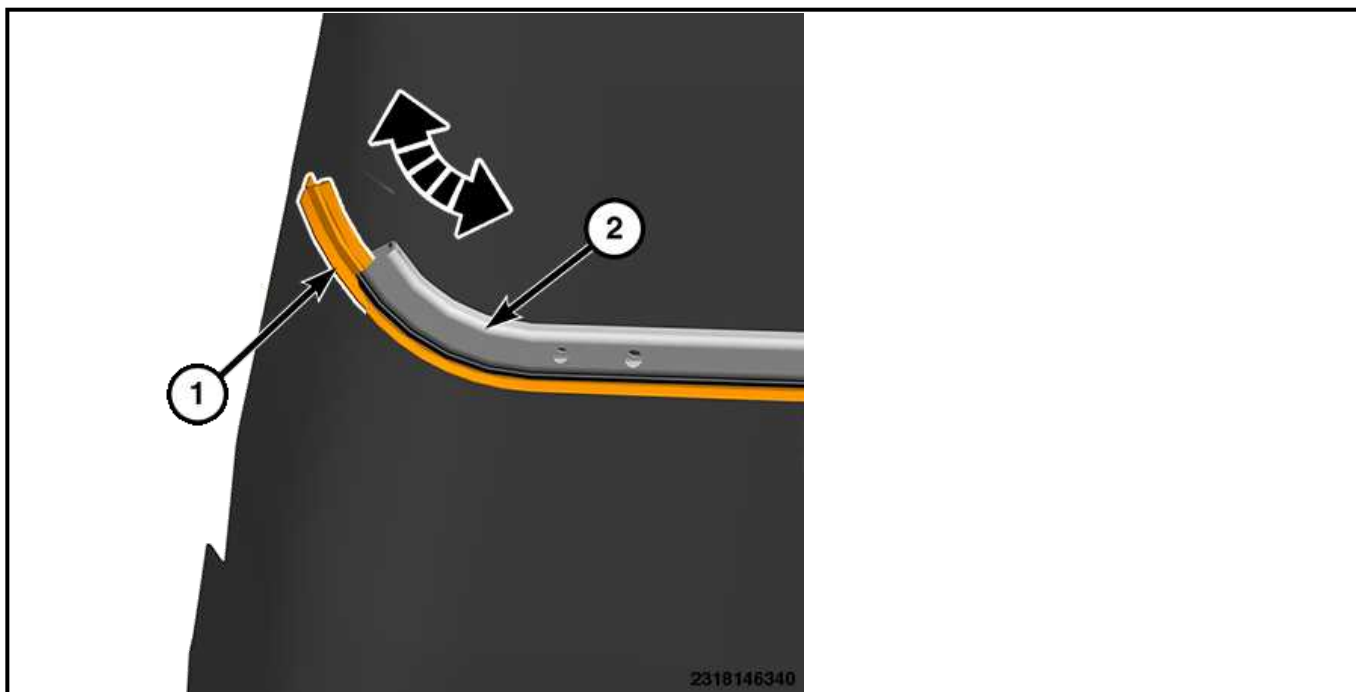


4. Slide the bow (2) off the soft top support bead (1) and remove the bow.



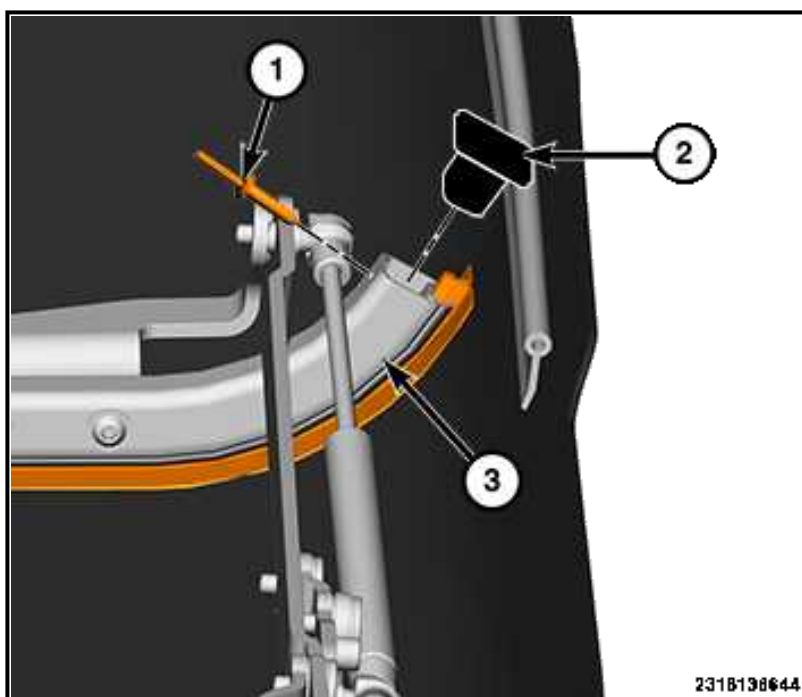
1. BOW #1
2. BOW #2
3. BOW #3
4. BOW #4
5. BOW #5

NOTE: Each bow has unique fastener lengths. Refer to the illustration for correct fastener locations.

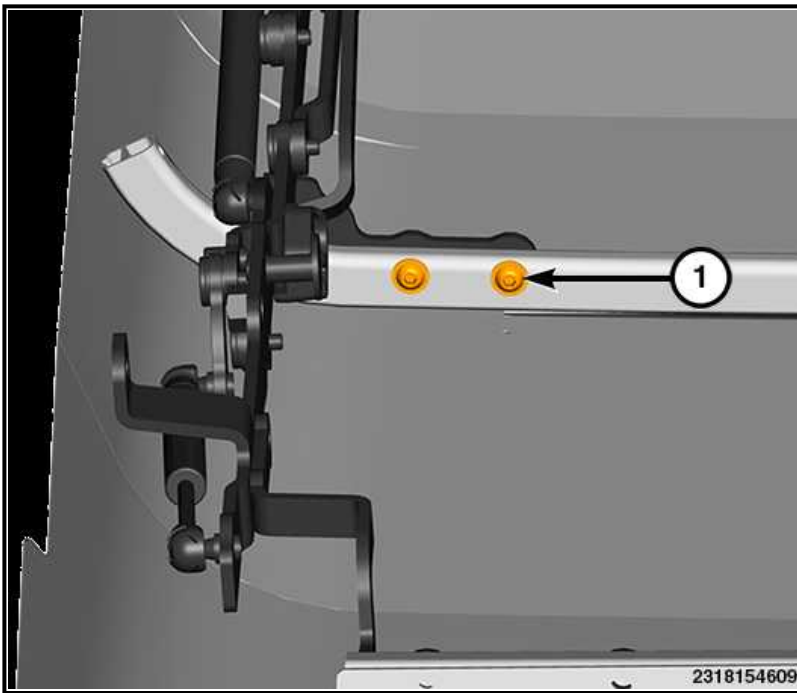


INSTALLATION

1. Slide the bow (2) on the soft top support bead (1).



2. Install the end caps (2) and install new rivets (1).

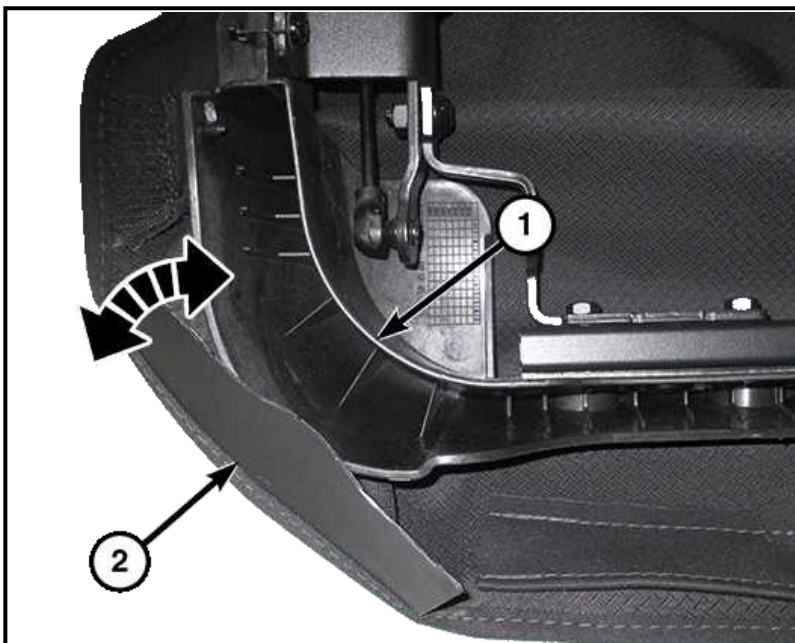


3. Install the fasteners (1).
4. Close the top, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

BOW, ASSEMBLY, NUMBER 5

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

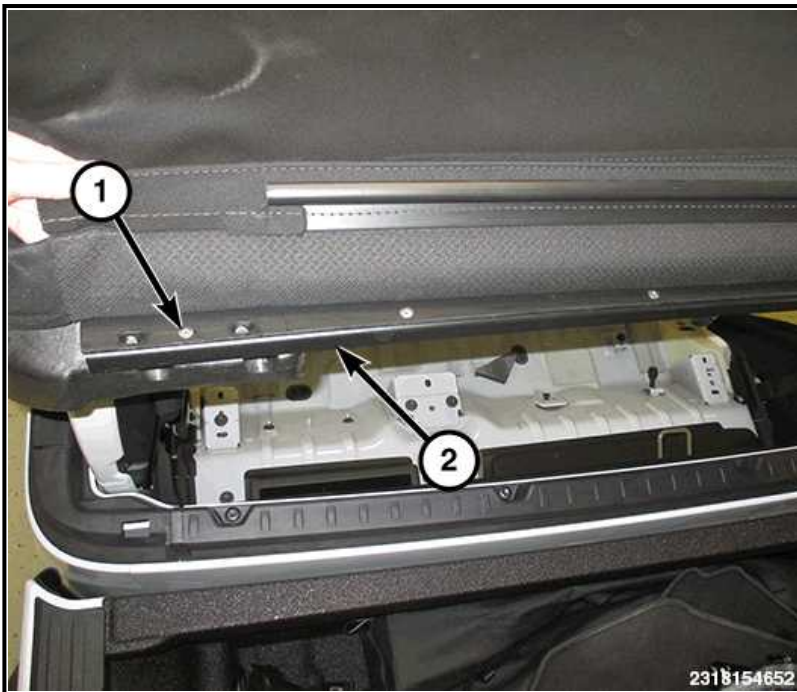


REMOVAL

1. Remove the rear window and rear quarter panels as needed, Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Release the cover tabs (2) from the seal brackets (1).

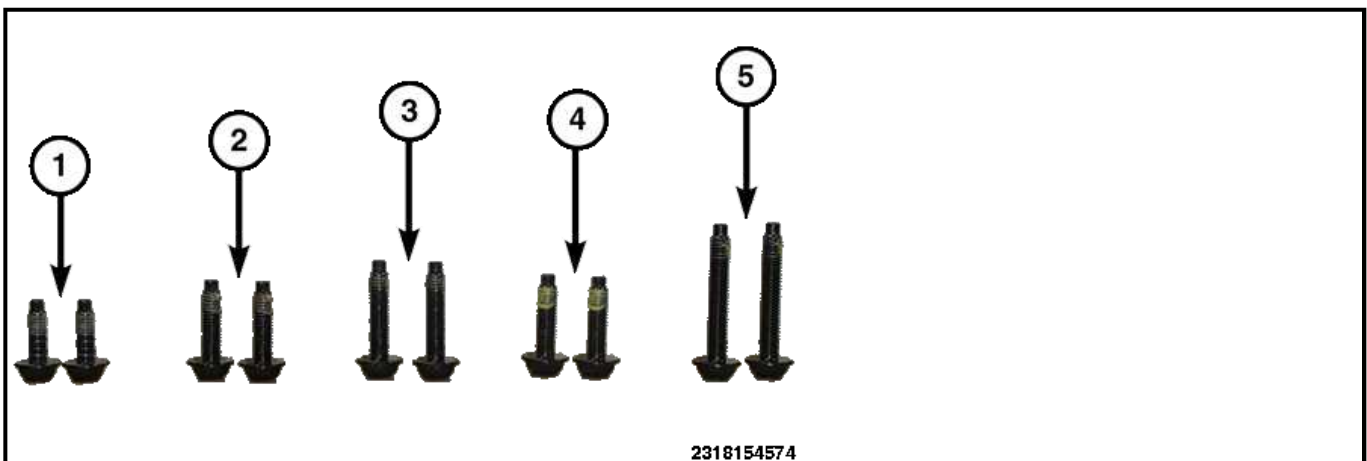


3. Remove the screws (1) attaching the bow to the bow brackets.



4. Lift cover and bow assemblies (2) up off of the linkages and corner brackets

5. Remove the seven rivets (1) and separate the bow from the cover.



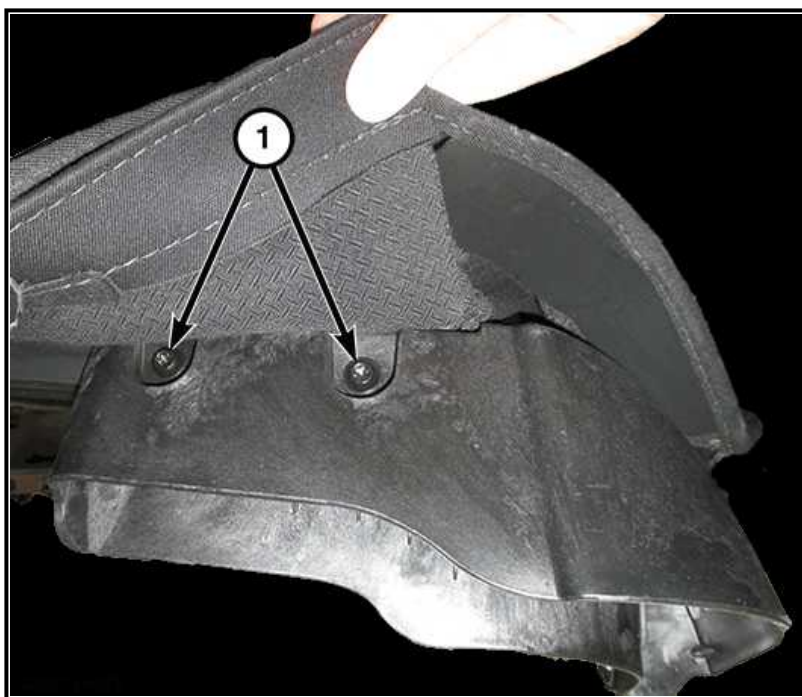
1. BOW #1
2. BOW #2
3. BOW #3
4. BOW #4
5. BOW #5

NOTE: Each bow has unique fastener lengths. Refer to the illustration for correct fastener locations.

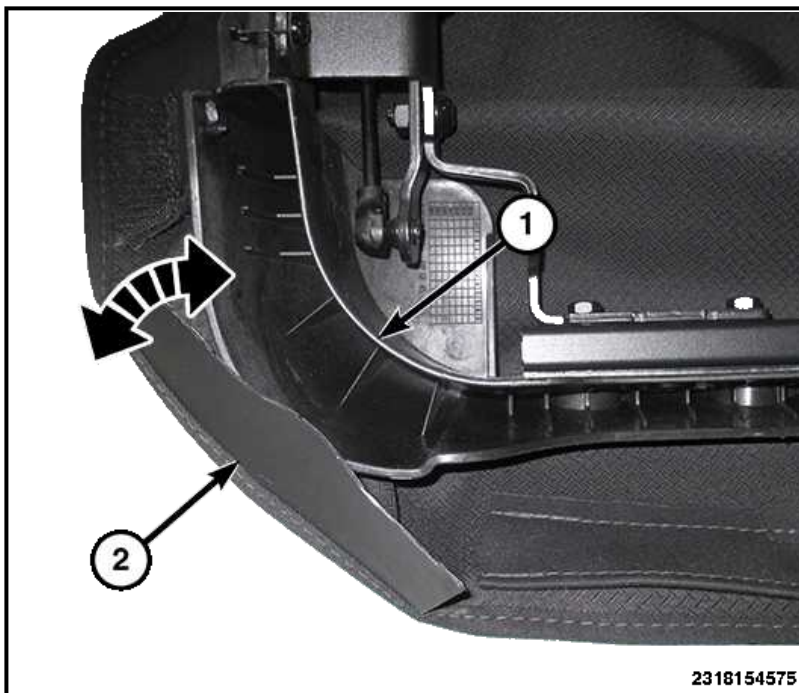


INSTALLATION

1. Install the #5 bow on the cover and install seven new rivets (1).



2. Install the screws (1) attaching the bow brackets to the bow and tighten securely.

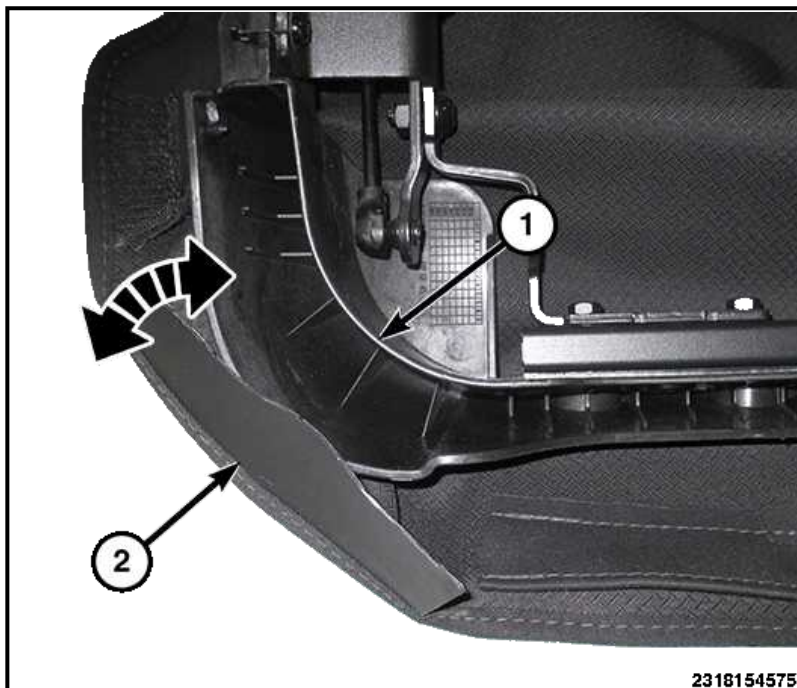


3. Secure the cover tab (2) into the seal bracket (1).
4. Install the rear window and rear quarter panel as needed, Refer to [**FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION.**](#)

BRACKET, BOW NUMBER 5

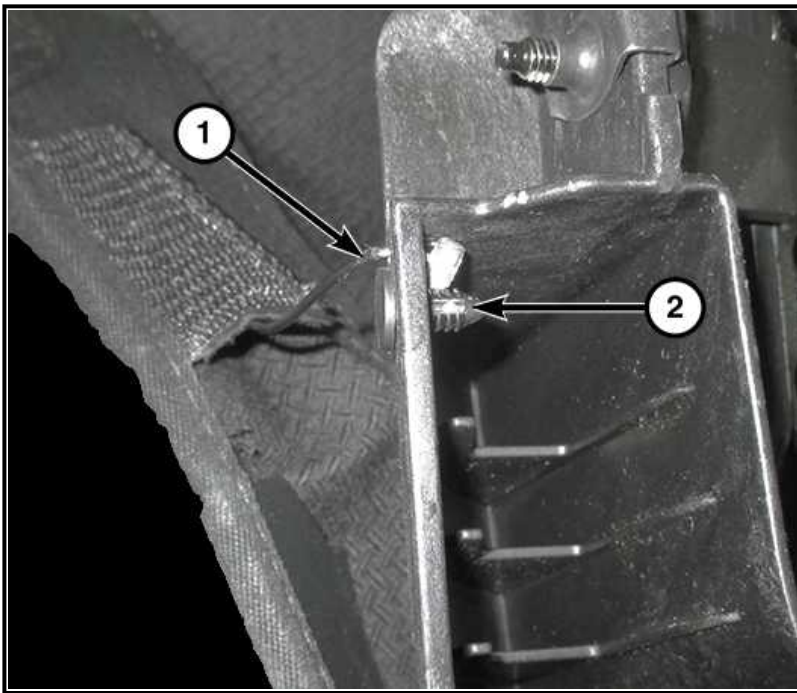
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

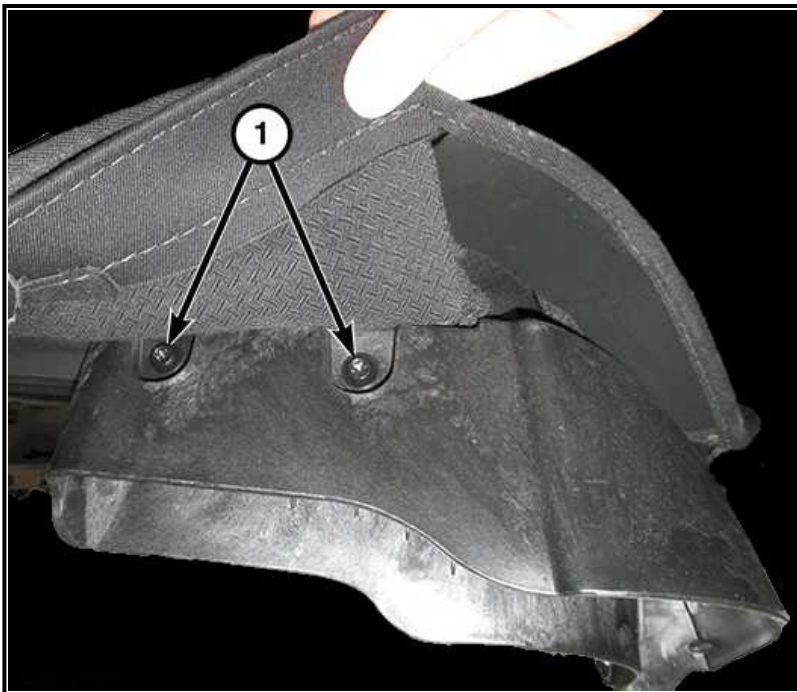


REMOVAL

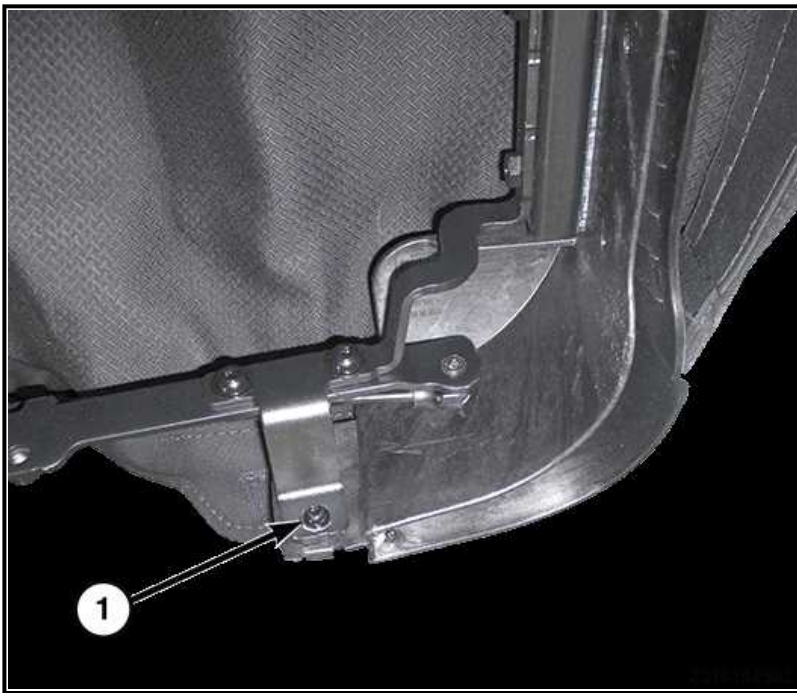
1. Remove the rear window and rear quarter panel as needed, Refer to [**FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION.**](#)
2. Release the cover tab (2) from the seal bracket (1).



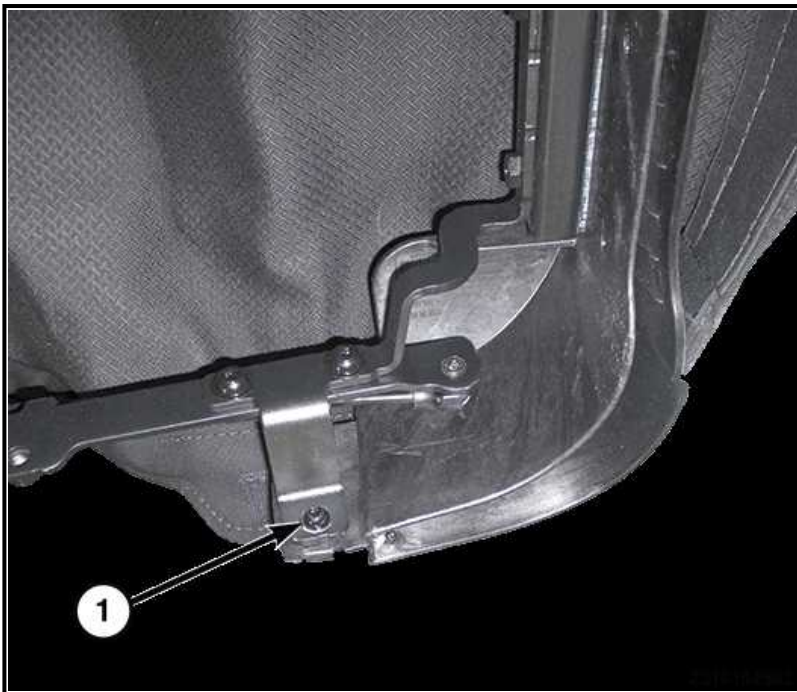
3. Remove the push pin fastener (2) and release the cable (1) from the rear bracket.



4. Remove the fasteners (1) attaching the bracket to the bow.



5. Remove the fastener (1) attaching the bracket to the linkage assembly and remove the bracket.

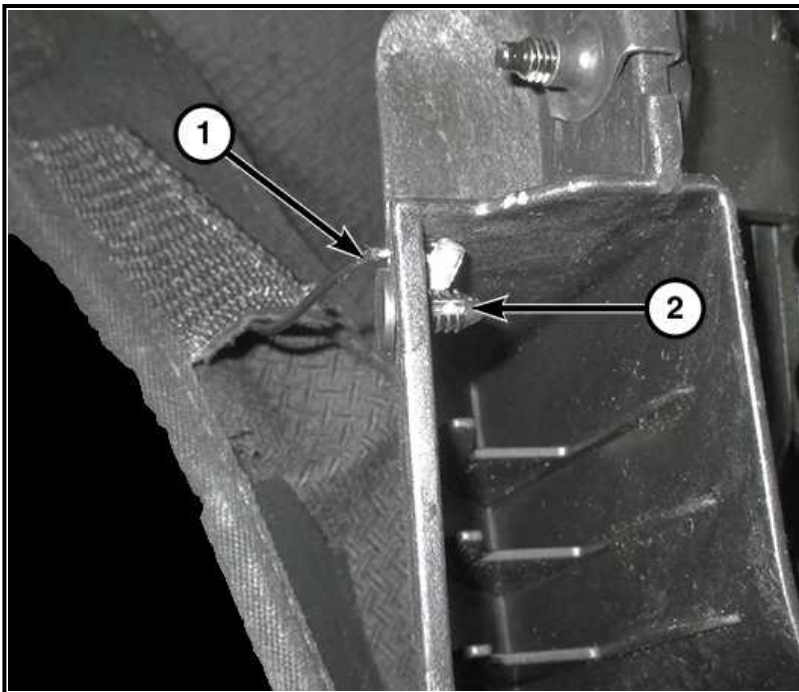


INSTALLATION

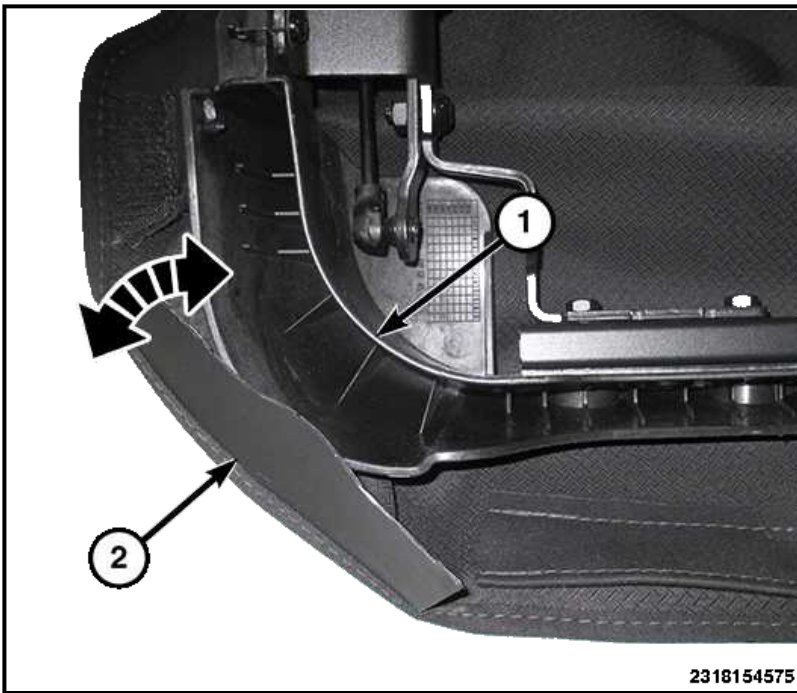
1. Install the bracket to the bow and linkage assembly and install the fastener (1).



2. Install the fasteners (1) attaching the bracket to the bow.



3. Connect the cable (1) to the rear bracket and install the push pin (2).

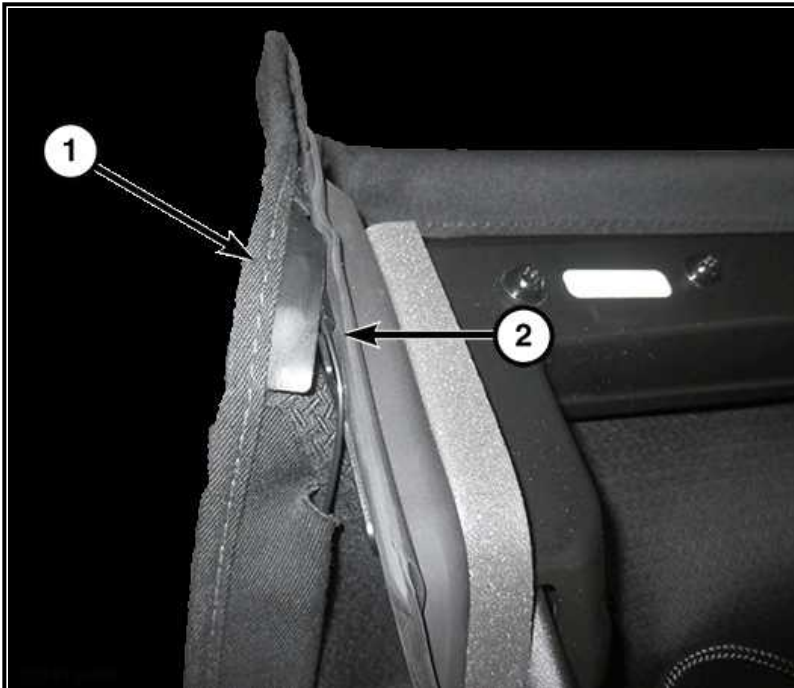


4. Secure the cover tab (2) into the seal bracket (1).
5. Close the top as needed. Refer to [**FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION**](#).
6. Install the rear window and rear quarter panel as needed, Refer to [**FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION**](#).

CABLE, TENSION

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

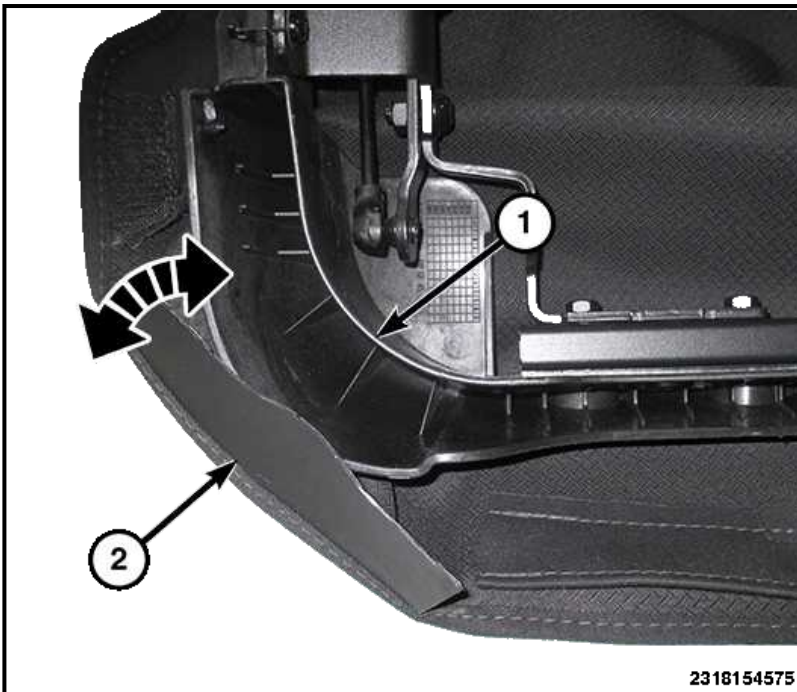


REMOVAL

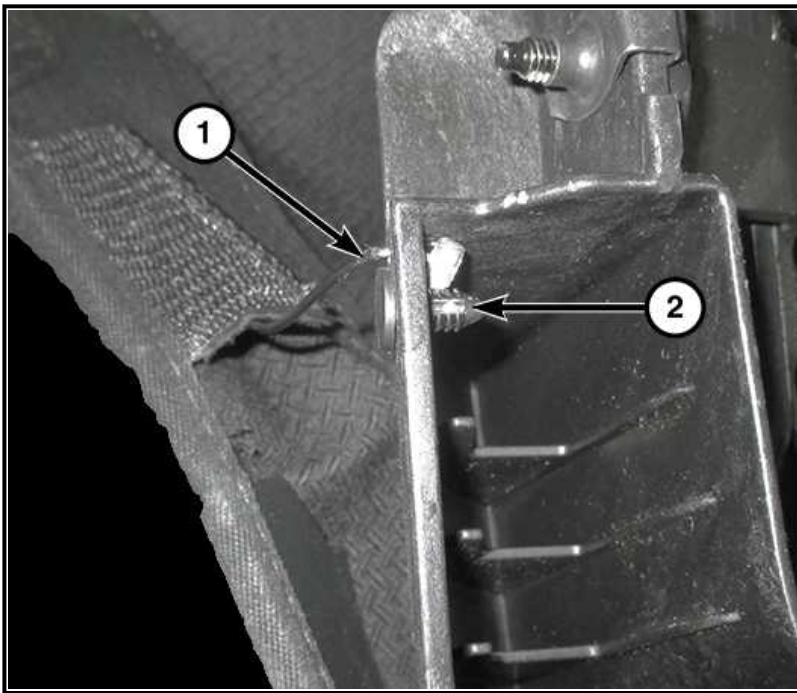
1. Remove the rear window and rear quarter panels as needed, Refer to [**FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION**](#).
2. Release the cover tab (1) from the front seal bracket (2).



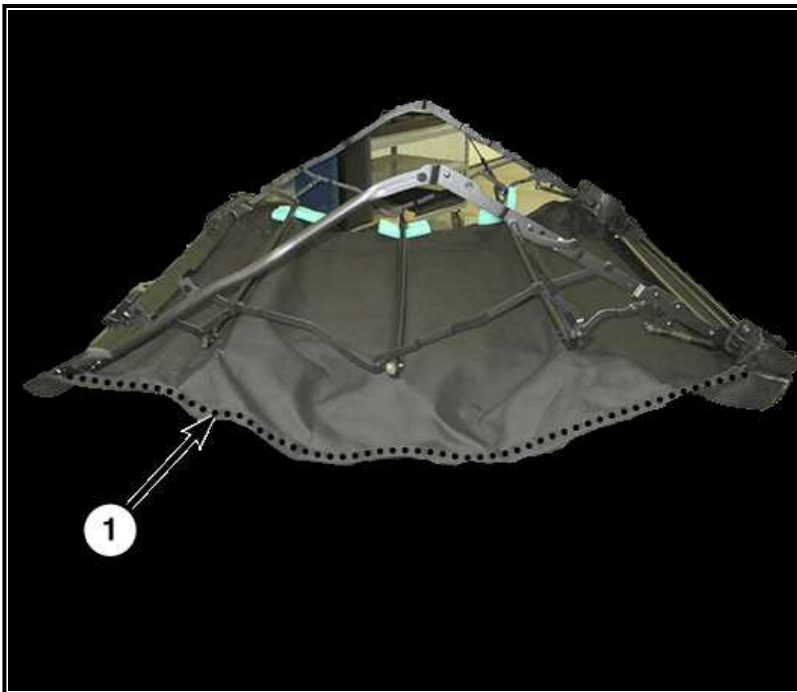
3. Disconnect the cable (1) from the seal bracket.



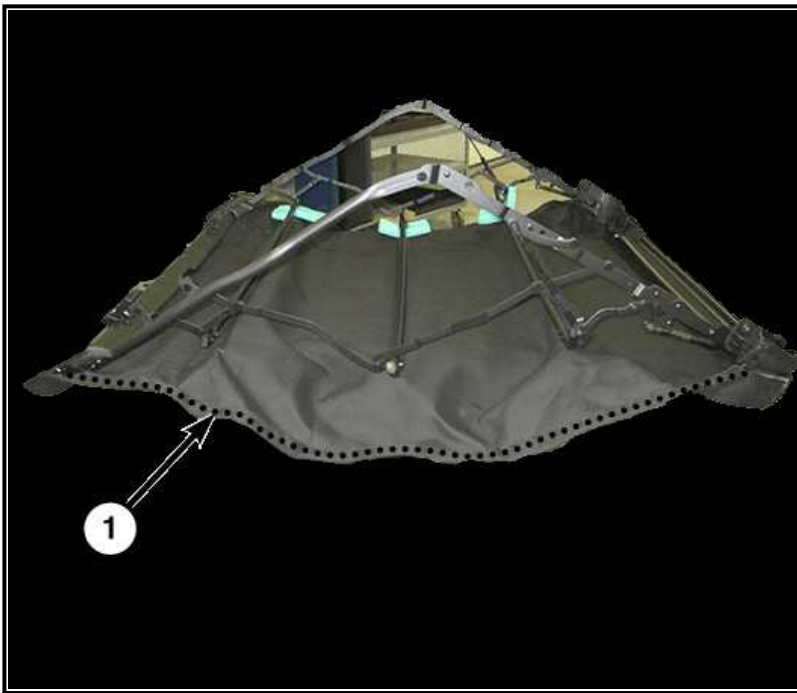
4. Release the cover tabs (2) from the seal bracket (1).



5. Remove the push pin fastener (2) and release the cable (1) from the rear bracket.

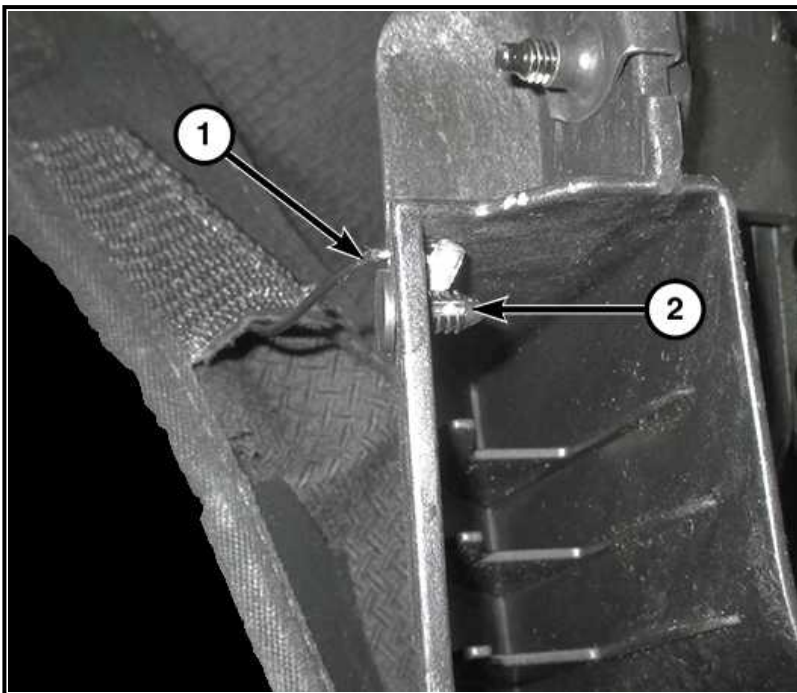


6. Remove the cable (1) from the pocket sewn into the side of the cover.

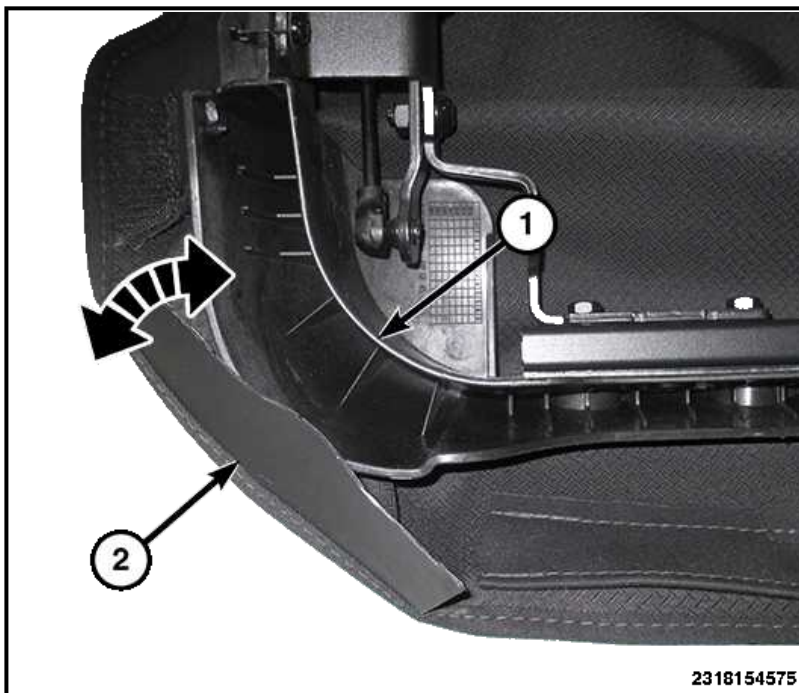


INSTALLATION

1. Install the cable (1) into the pocket sewn into the side of the cover.



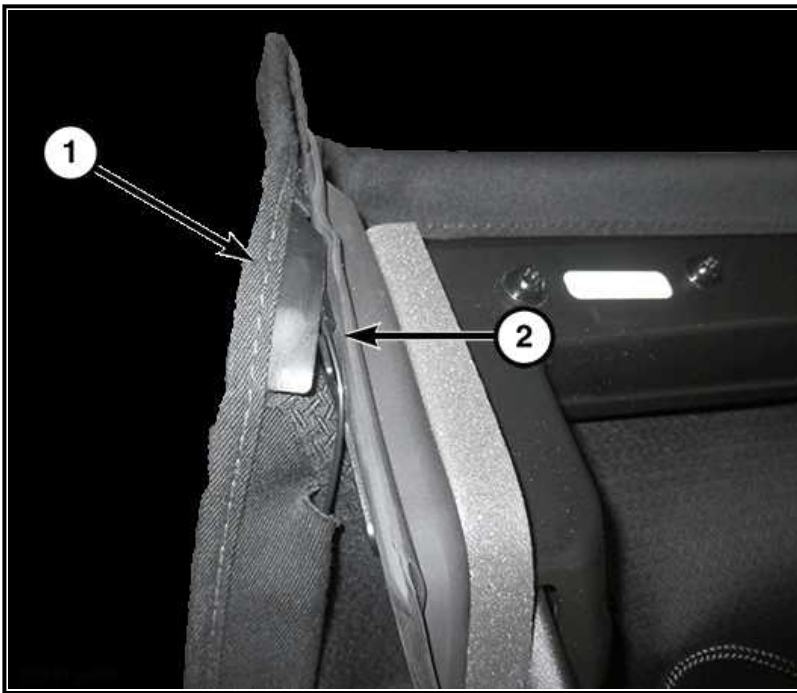
2. Connect the cable (1) to the rear bracket and install the push pin (2).



3. Secure the cover tab (2) into the seal bracket (2).



4. Connect the cables (1) into the seal bracket.



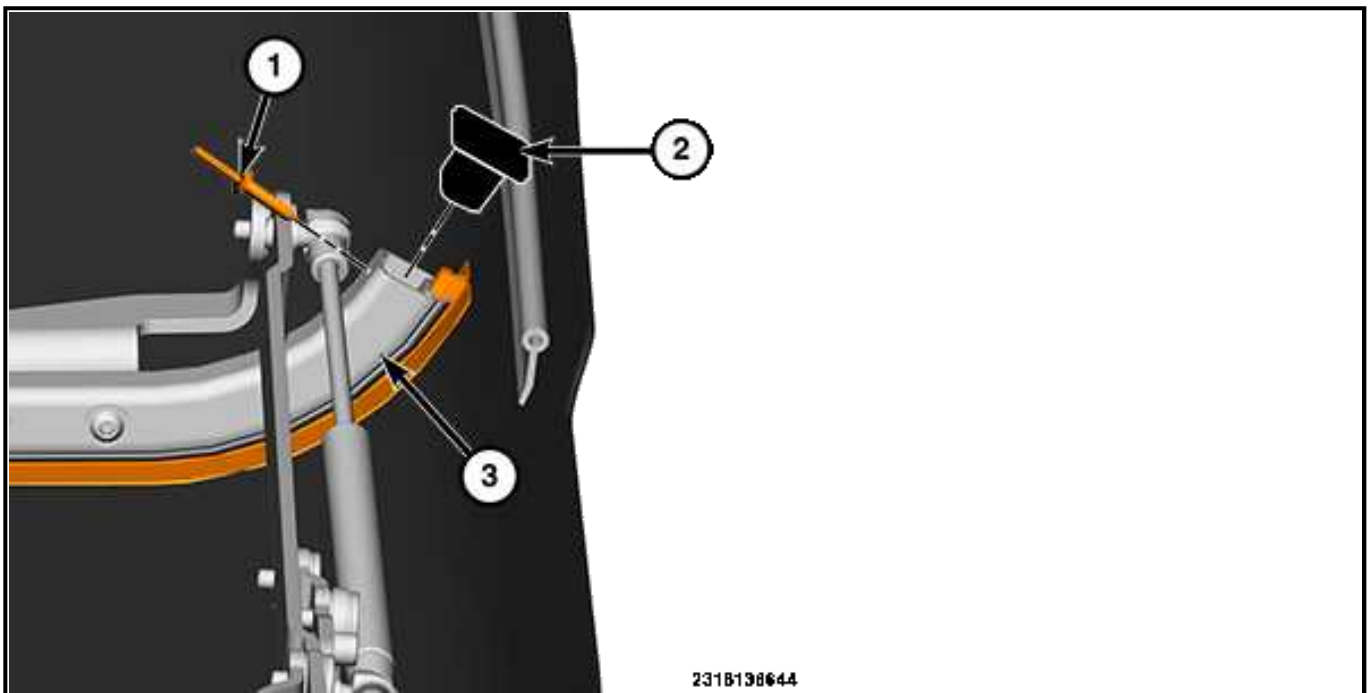
5. Secure the cover tab (1) into the seal bracket (2).

6. Install the rear window and rear quarter panel as needed, Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

COVER, FOLDING TOP

REMOVAL AND INSTALLATION

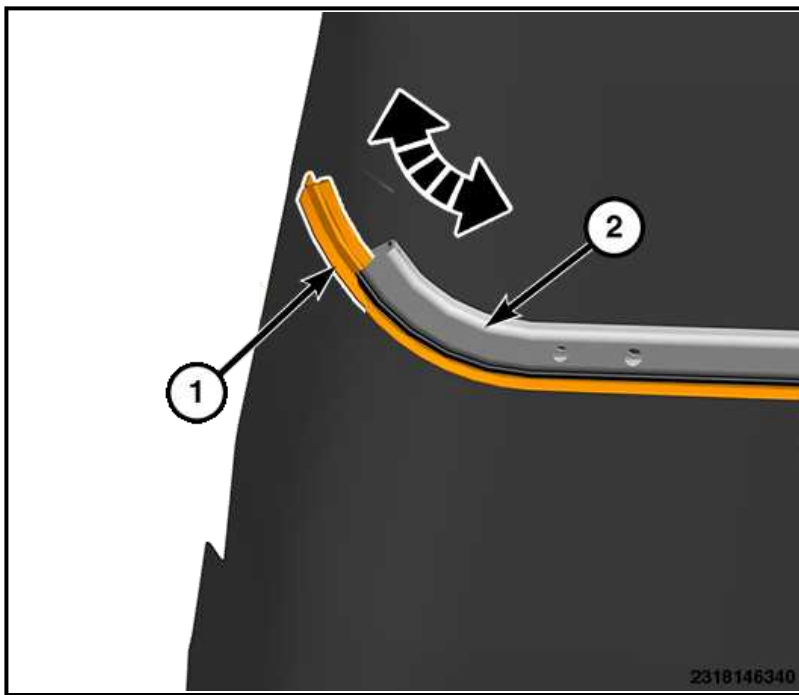
REMOVAL AND INSTALLATION



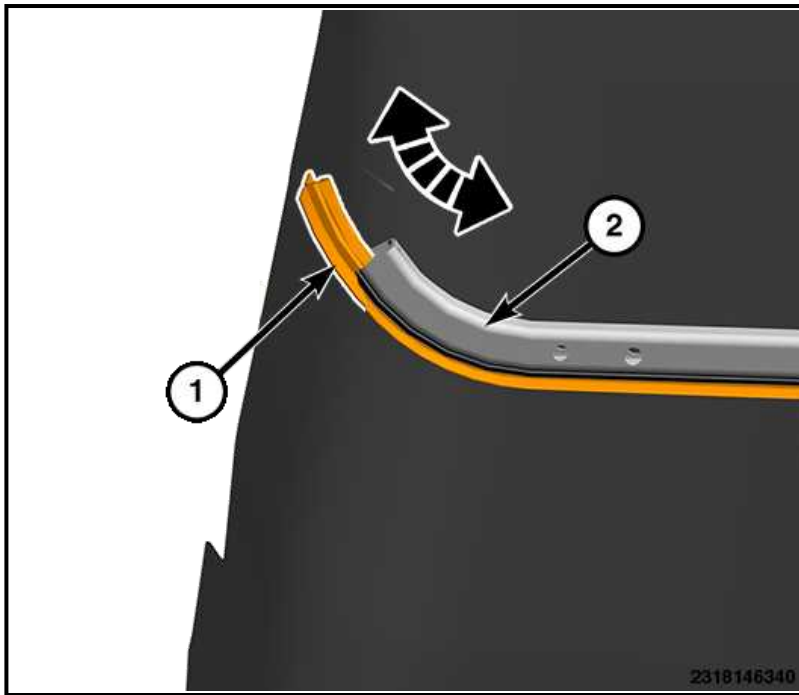
REMOVAL

1. Remove the linkage assemblies. Refer to [LINKAGE, REMOVAL AND INSTALLATION](#).

2. Remove the rivets (1) and remove the end caps (2).

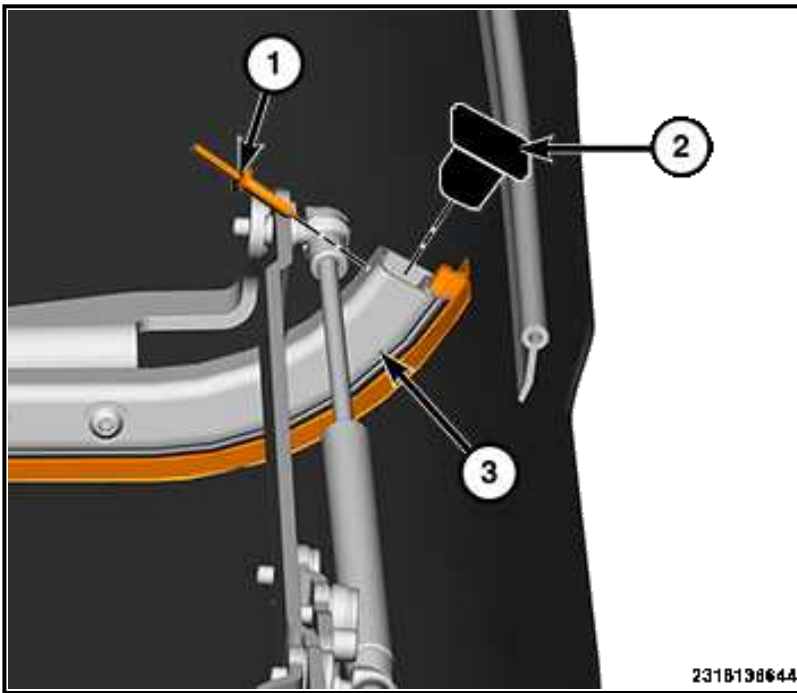


3. Slide the cover support beads (1) off of the bows (2) and remove the cover.



INSTALLATION

1. Position the bows onto the cover assembly and slide the support beads (1) into the bows (2).

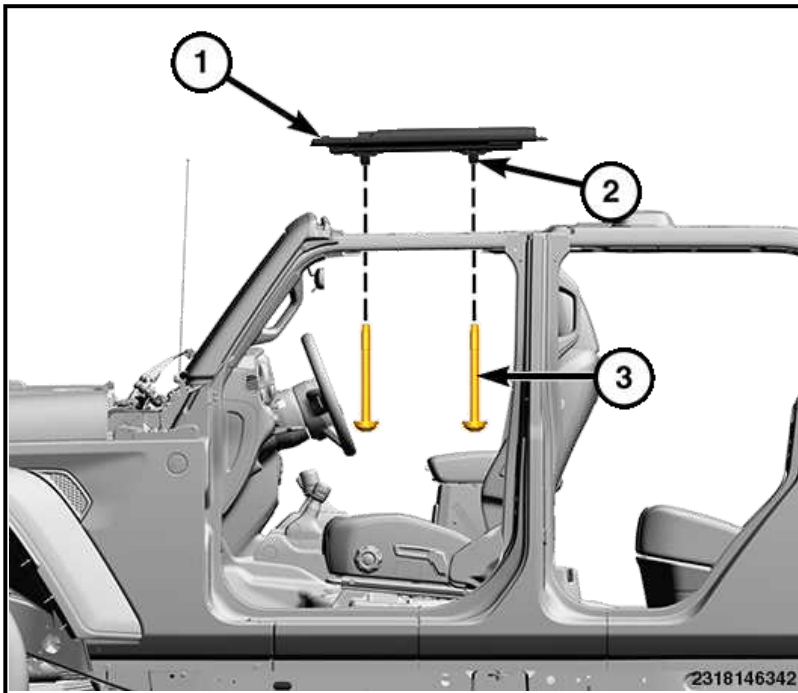


2. Install the bow end caps (2) and install new rivets (1).
3. Install the linkage assemblies. Refer to [LINKAGE, REMOVAL AND INSTALLATION](#).

FRAME, DOOR FRONT

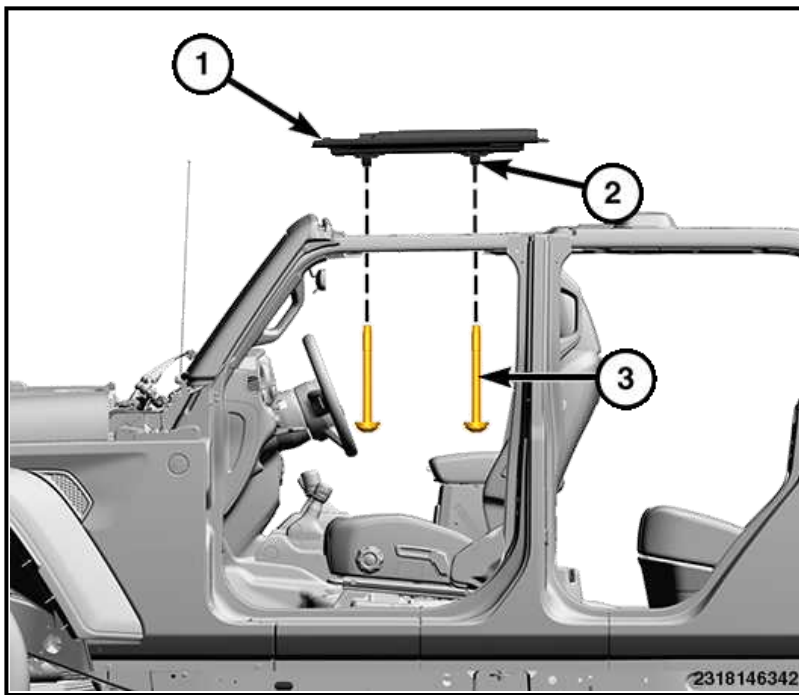
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Remove the rear door rail Refer to [FRAME, DOOR FRONT, REMOVAL AND INSTALLATION](#) [FRAME, DOOR REAR, REMOVAL AND INSTALLATION](#).
2. Remove the bolts (3) and open the brackets (2).
3. Remove the door frame rail (1).



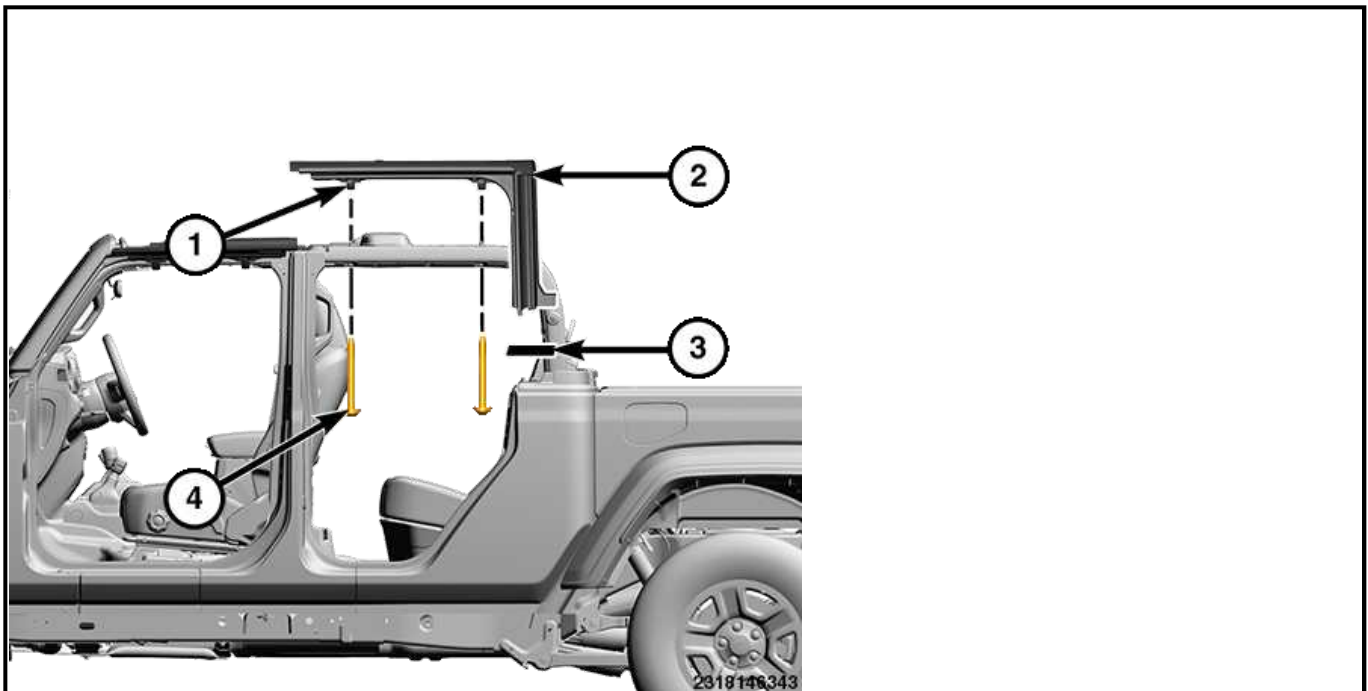
INSTALLATION

1. Install the door frame rail (1).
2. Close the brackets (2) and install the bolts (3).
3. Install the rear door rail Refer to [FRAME, DOOR REAR, REMOVAL AND INSTALLATION](#).

FRAME, DOOR REAR

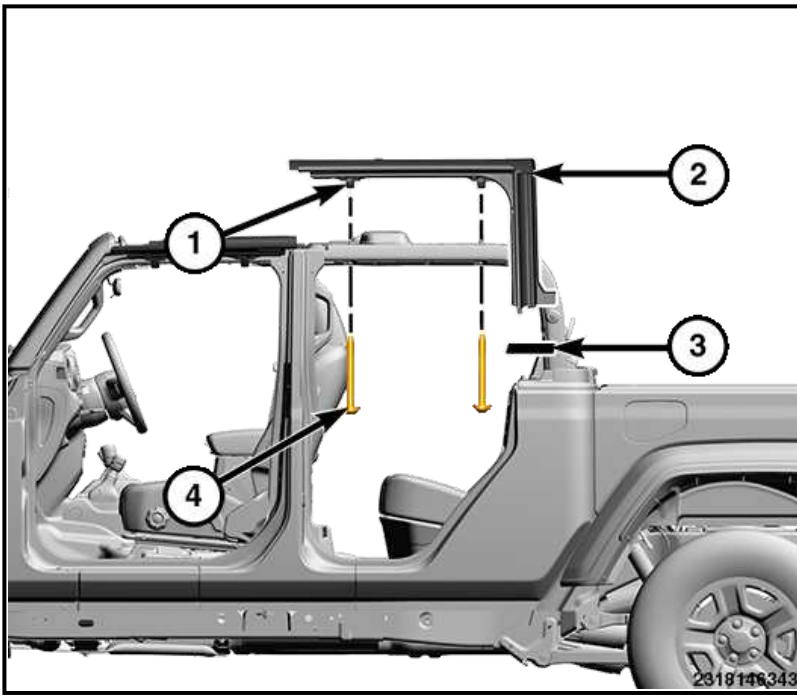
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Remove the soft top Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the bolts (4) and open the brackets (1).
3. Remove the door frame rail (2).



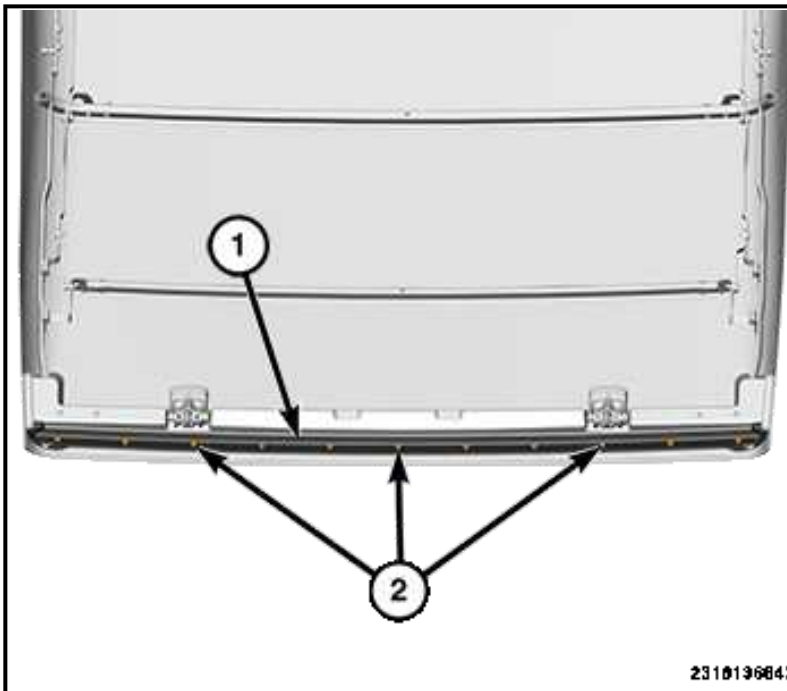
INSTALLATION

1. Install a new foam seal (3) if needed.
2. Install the door frame rail (2).
3. Close the brackets (1) and install the bolts (4).
4. Install the soft top Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

PANEL, COMPRESSION, BOW NUMBER 1

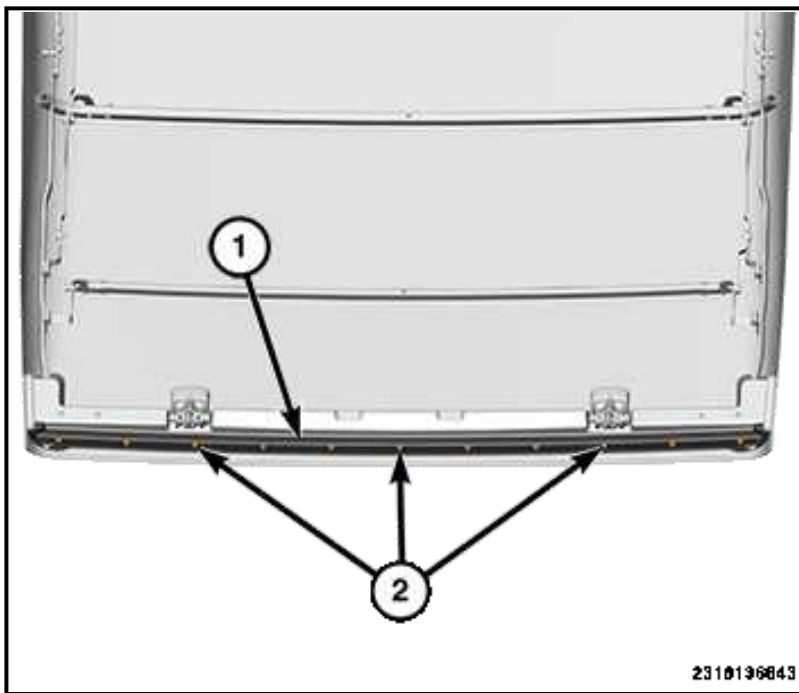
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Position the top into the full open position, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the screws (2) and separate the edge protector (1).



INSTALLATION

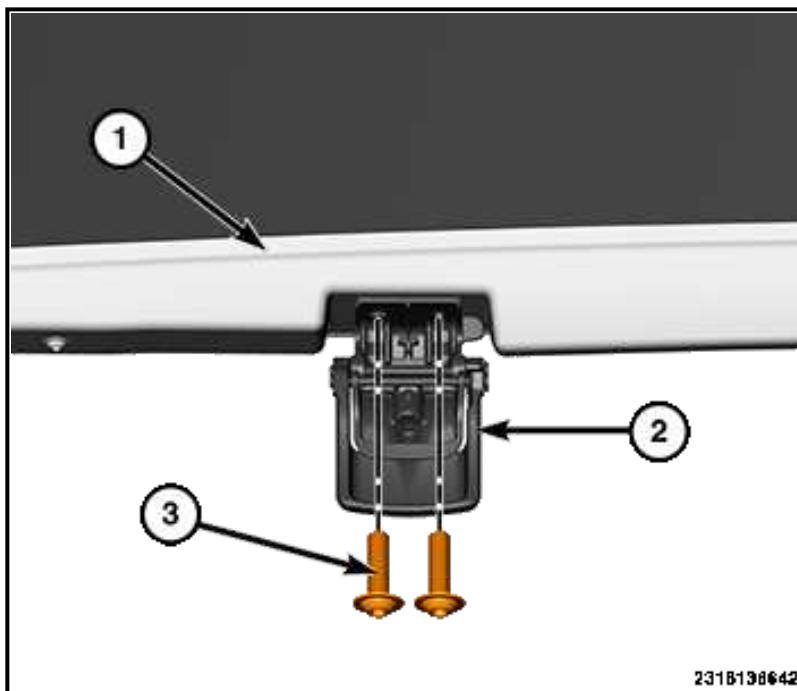
1. Install the edge protector (1) and install the screws (2).
2. Close the top, as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).

LATCH, HEADER

REMOVAL AND INSTALLATION

HEADER LATCH

REMOVAL



- | |
|---------------|
| 1 - #1 Bow |
| 2 - Latch |
| 3 - Fasteners |

1. Position the top into the full open position as needed. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the fasteners and remove the latch from the #1 Bow.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

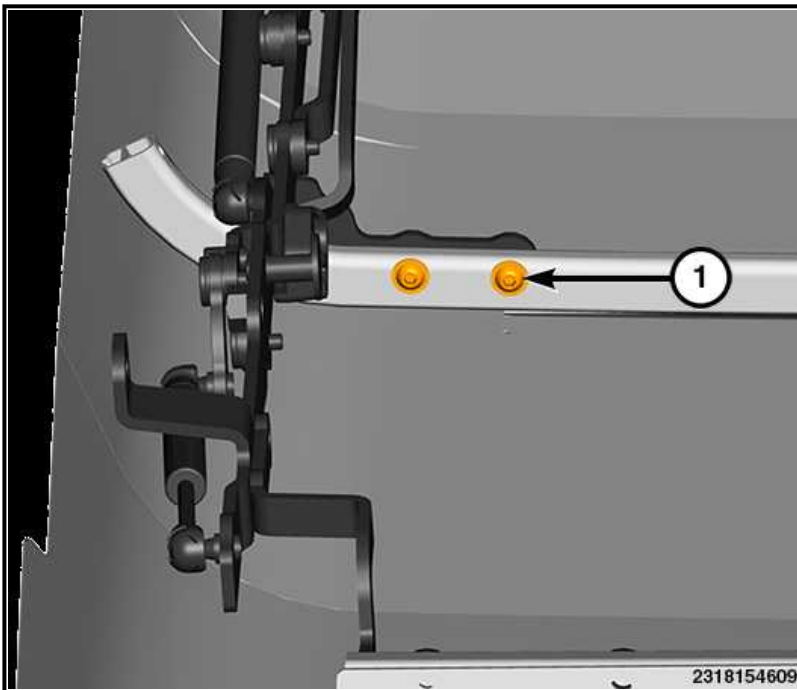
LINKAGE

REMOVAL AND INSTALLATION

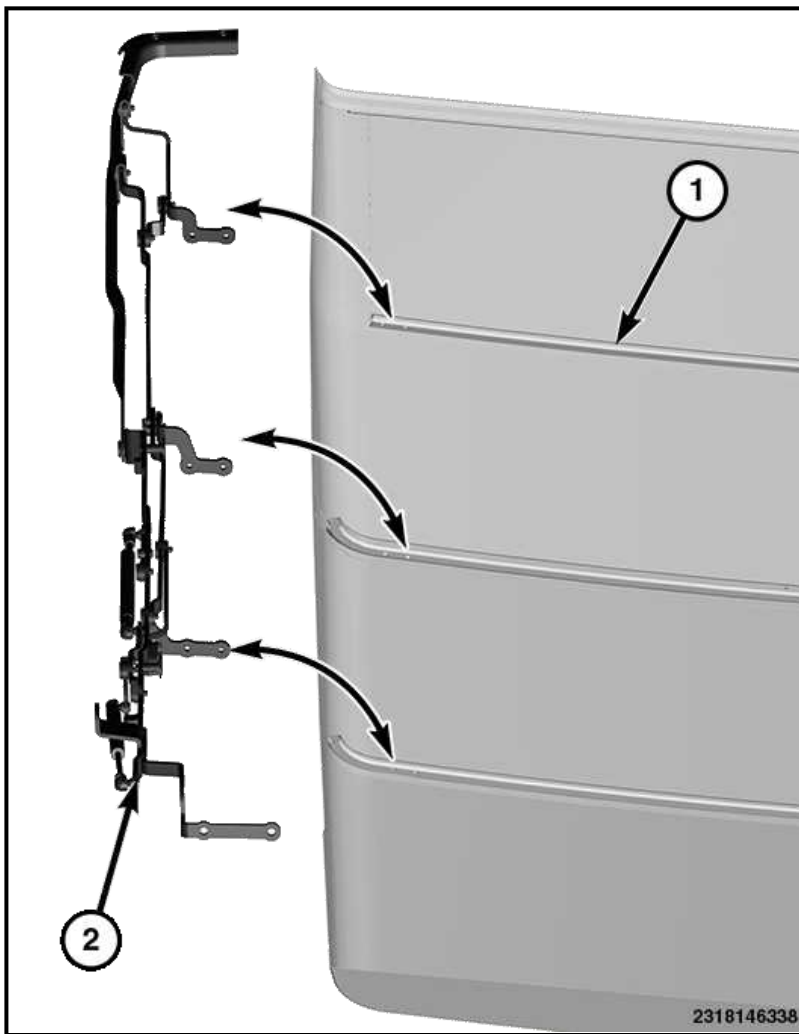
REMOVAL AND INSTALLATION

REMOVAL

1. Remove the folding top assembly. Refer to [FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION](#).
2. Remove the front bow. Refer to [BOW, ASSEMBLY, NUMBER 1, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 2, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 3, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 4, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 5, REMOVAL AND INSTALLATION](#).
3. Remove the rear bow. Refer to [BOW, ASSEMBLY, NUMBER 1, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 2, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 3, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 4, REMOVAL AND INSTALLATION](#)[BOW, ASSEMBLY, NUMBER 5, REMOVAL AND INSTALLATION](#).

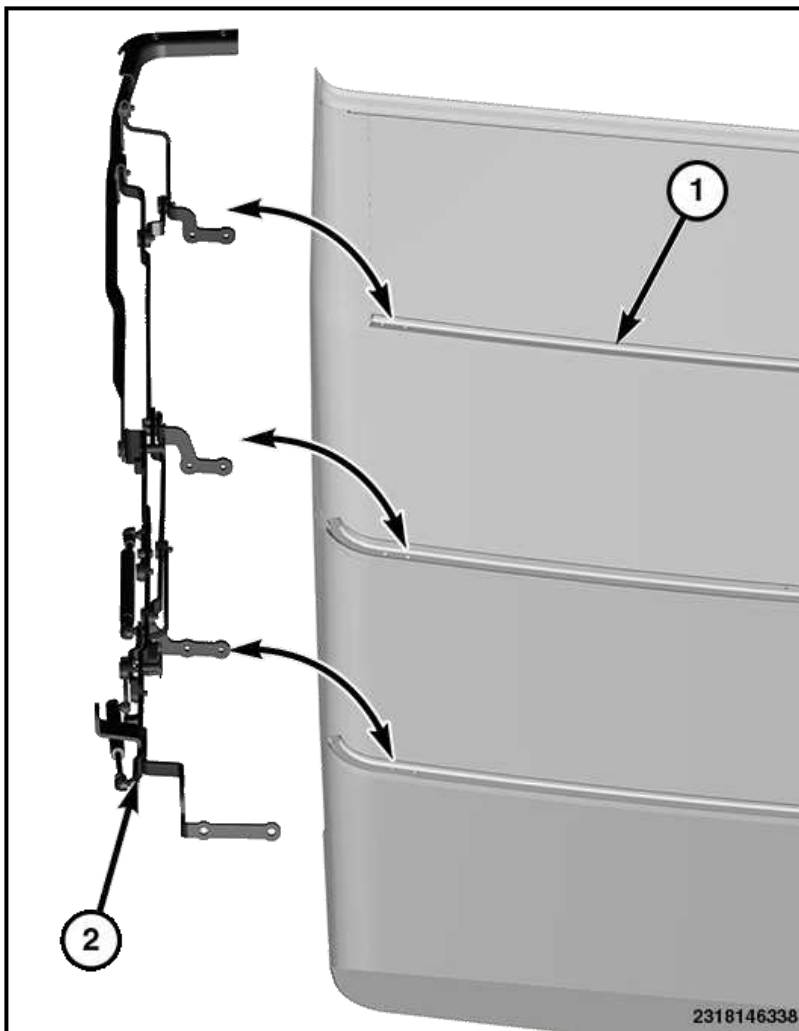


4. Remove the remaining linkage fasteners (1).



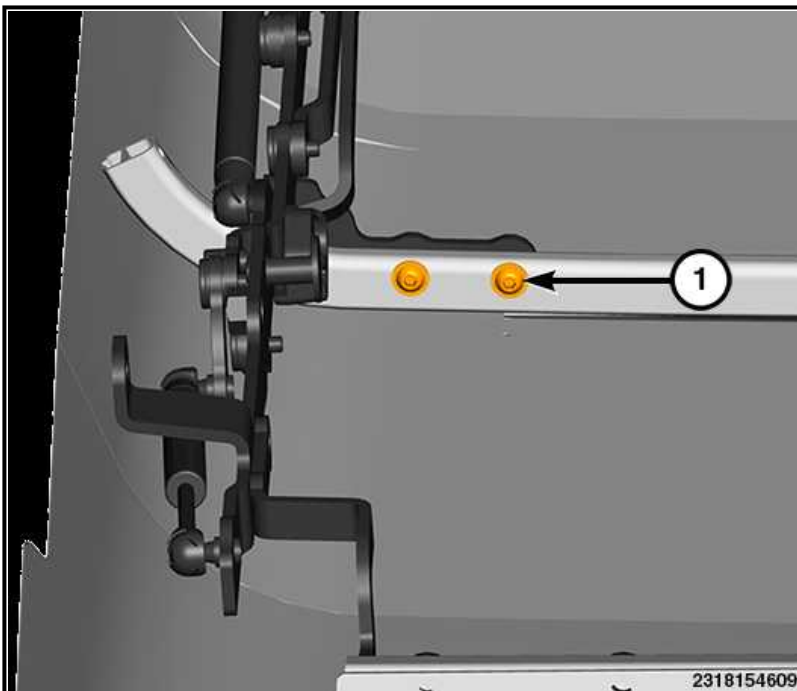
5. Remove the linkage assembly (2) off of the bows (1).

6. Remove the gas props. Refer to [PROP, GAS, REMOVAL AND INSTALLATION](#).



INSTALLATION

1. Install the gas props. Refer to [PROP, GAS, REMOVAL AND INSTALLATION](#).
2. Install the linkage assembly (2) to the bows (1).



3. Install the bow fasteners (1) on the three middle bows and tighten securely.
4. Install the rear bow. Refer to [BOW, ASSEMBLY, NUMBER 1, REMOVAL AND INSTALLATION](#) [BOW, ASSEMBLY, NUMBER 2, REMOVAL AND INSTALLATION](#)

ASSEMBLY, NUMBER 3, REMOVAL AND INSTALLATION**BOW, ASSEMBLY, NUMBER 4, REMOVAL AND INSTALLATION****BOW, ASSEMBLY, NUMBER 5, REMOVAL AND INSTALLATION**.

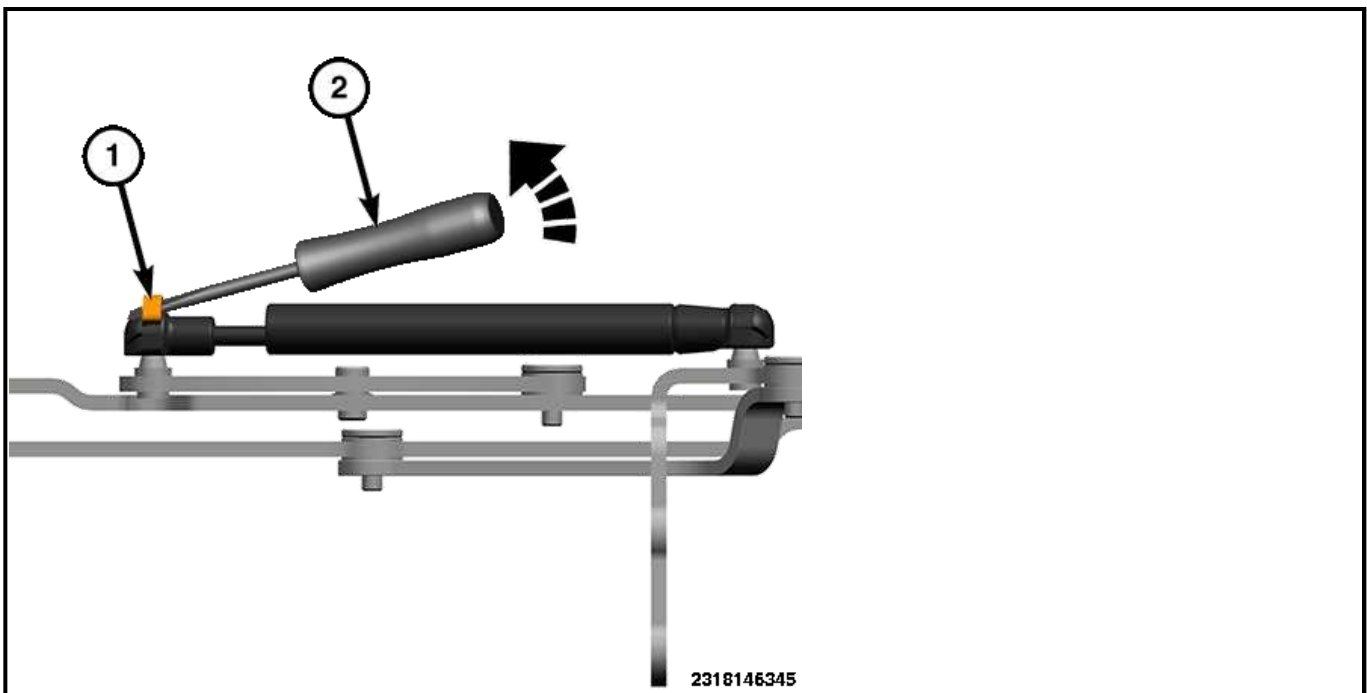
5. Install the front bow. Refer to **BOW, ASSEMBLY, NUMBER 1, REMOVAL AND INSTALLATION****BOW, ASSEMBLY, NUMBER 2, REMOVAL AND INSTALLATION****BOW, ASSEMBLY, NUMBER 3, REMOVAL AND INSTALLATION****BOW, ASSEMBLY, NUMBER 4, REMOVAL AND INSTALLATION****BOW, ASSEMBLY, NUMBER 5, REMOVAL AND INSTALLATION**.
6. Install the folding top assembly. Refer to **FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION**.

PROP, GAS

REMOVAL AND INSTALLATION

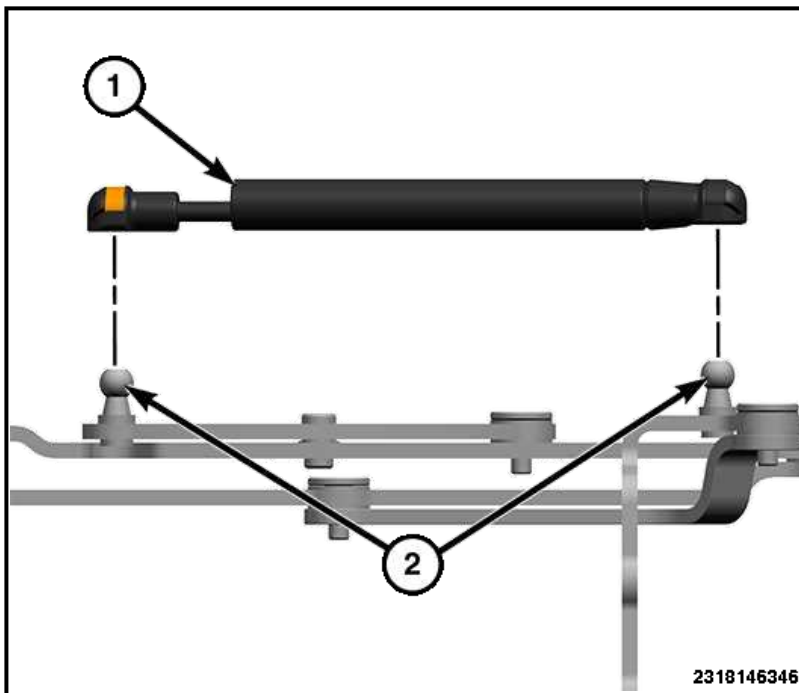
REMOVAL AND INSTALLATION

CAUTION: Do not use any type of pliers on the machined surface of the gas prop to assist in supporting the glass. Use a proper device for support, or the help of an assistant.

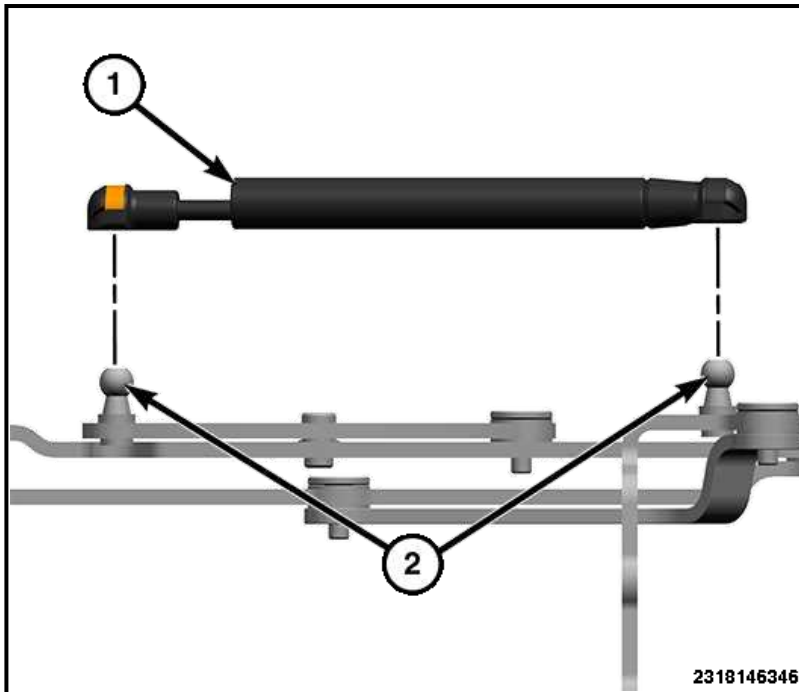


REMOVAL

1. Open the top to that the prop (1) being worked on is in the fully extended position, as needed. Refer to **FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION**.
2. Using a small flat bladed tool (2) or equivalent, release the retaining clips (1) while pulling the ball sockets away from the ball studs.



3. Remove the support cylinder (1) from the ball studs (2).



INSTALLATION

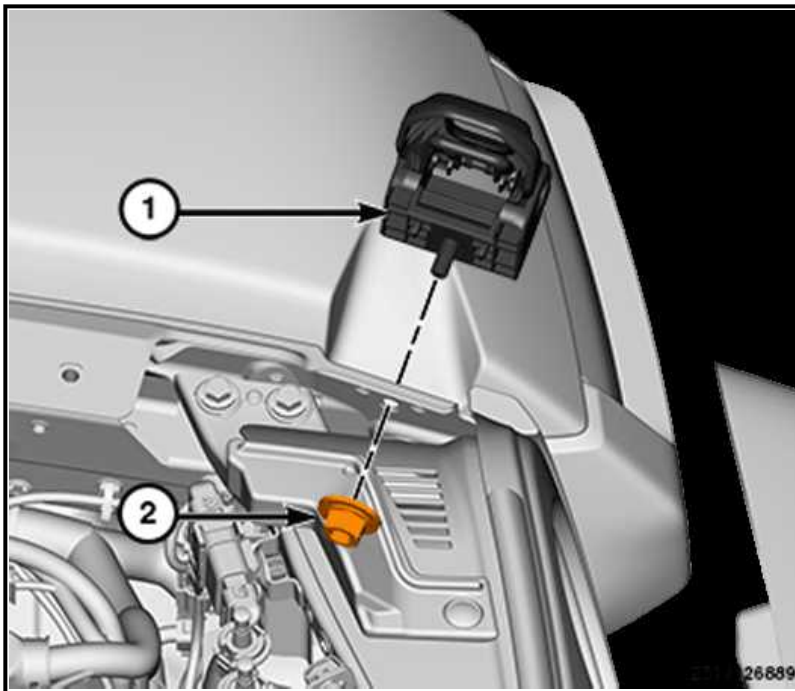
1. Make sure the retaining clips are seated into the ball socket fully.
2. Install the support cylinder (1) over the ball studs (2) with the thin end connected to the body and the retaining clips snapping into place.
3. Close the top, as needed. Refer to **FOLDING SOFT TOP, 4 DOOR, REMOVAL AND INSTALLATION**.

HOOD

CATCH, HOOD

REMOVAL AND INSTALLATION

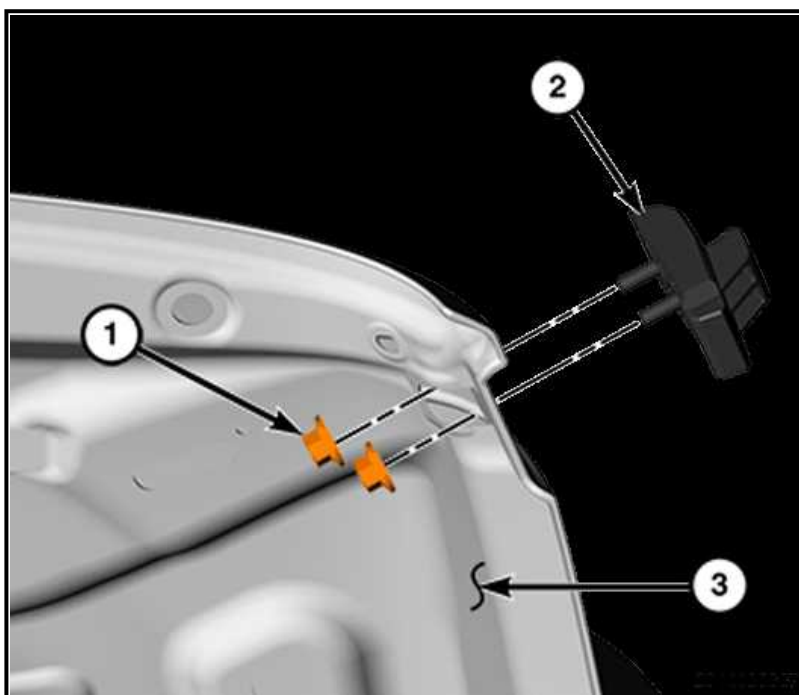
HOOD CATCH



- | |
|----------------|
| 1 - Hood Catch |
| 2 - Nut |

REMOVAL

1. Open the hood.
2. Remove the nut and remove the hood catch.



- | |
|------------------------|
| 1 - Nuts |
| 2 - Hood Catch Bracket |

3. Remove the nuts and remove the catch bracket.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Tighten the hood catch bracket nuts to the proper Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the hood catch nut to the proper Refer to [TORQUE SPECIFICATIONS](#) .

HINGE, HOOD

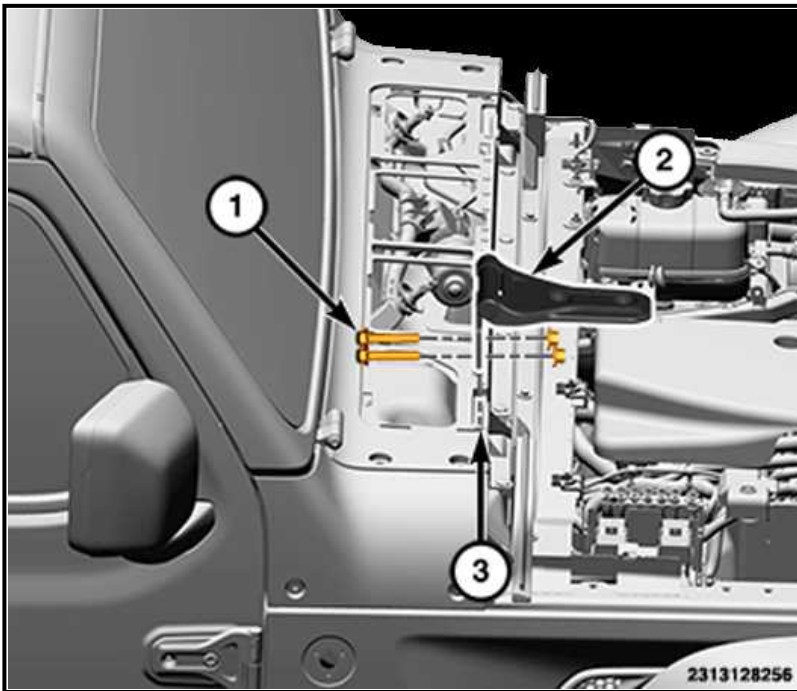
REMOVAL AND INSTALLATION

HOOD HINGE

REMOVAL

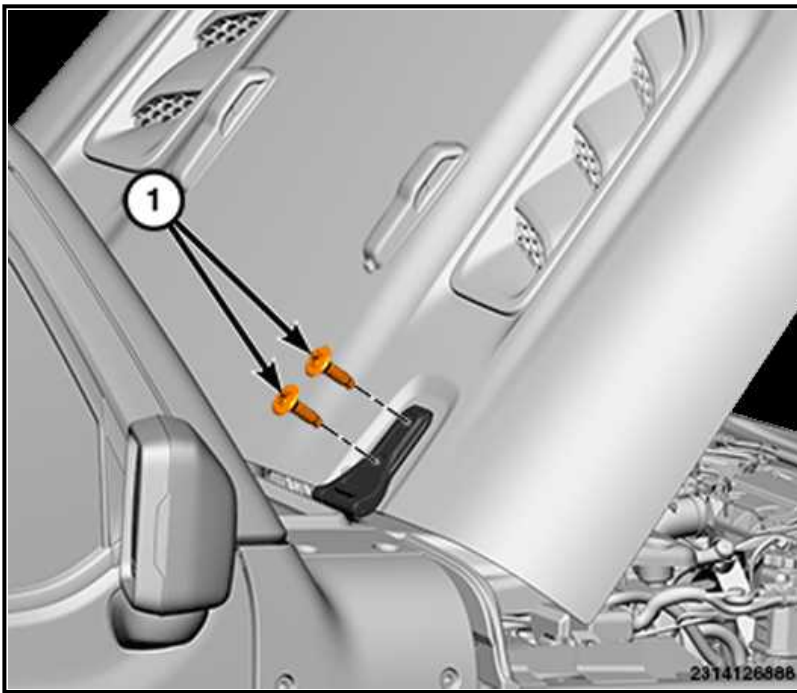
1. Remove the cowl cover, Refer to [COVER, COWL PANEL, REMOVAL AND INSTALLATION](#).

NOTE: It is not necessary to remove the hood to replace the hood hinges. Hood hinges can be replaced one at a time.



1 - Bolts
2 - Hinge
3 - Body

2. Support the hood with a suitable device.
3. Remove the hinge to body bolts.



1 - Bolts

4. Using a grease pencil or equivalent, mark location of hood hinges on hood to aid installation.
5. Remove the hinge to hood bolts and remove the hinge.

INSTALLATION

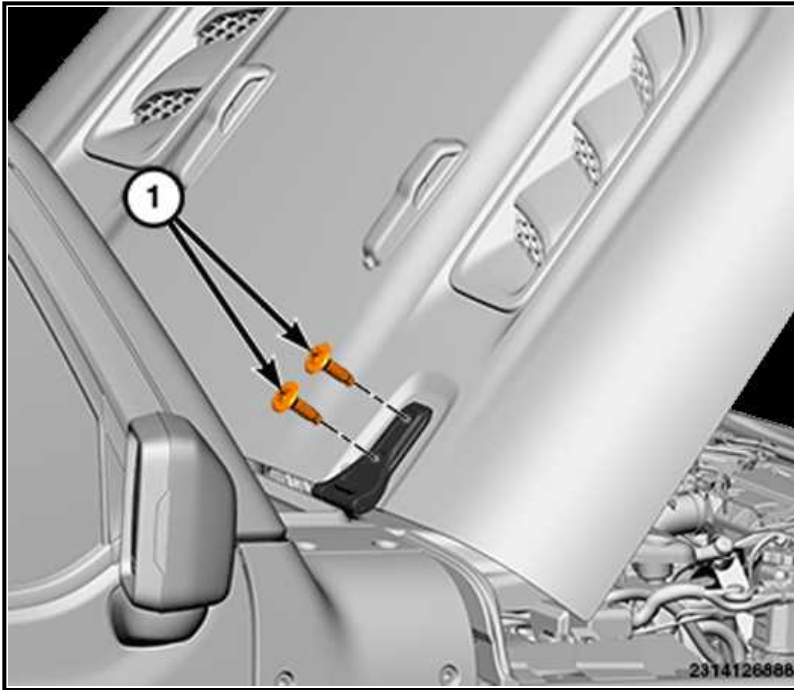
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- A suitable body sealant should be applied when removing or moving the hinges.
- Line up the hinge with the marks made on the hood during removal and tighten the bolts to the proper Refer to **TORQUE SPECIFICATIONS** .
- Tighten the hood to body bolts to the proper Refer to **TORQUE SPECIFICATIONS** .

HOOD

REMOVAL AND INSTALLATION

HOOD



1 - Bolts

REMOVAL

1. Raise the hood and support the hood.
2. Using a grease pencil or equivalent, mark location of hood hinges on hood to aid installation.
3. Remove the bolts attaching hinges to the hood.
4. With the aid of an assistant, remove hood from vehicle.

NOTE: The Vehicle Emission Control Information (VECI) label(s) must be in place for the life of the vehicle. When replacing the component in which the VECI label is adhered, a new VECI label must also be adhered to the new component.

INSTALLATION

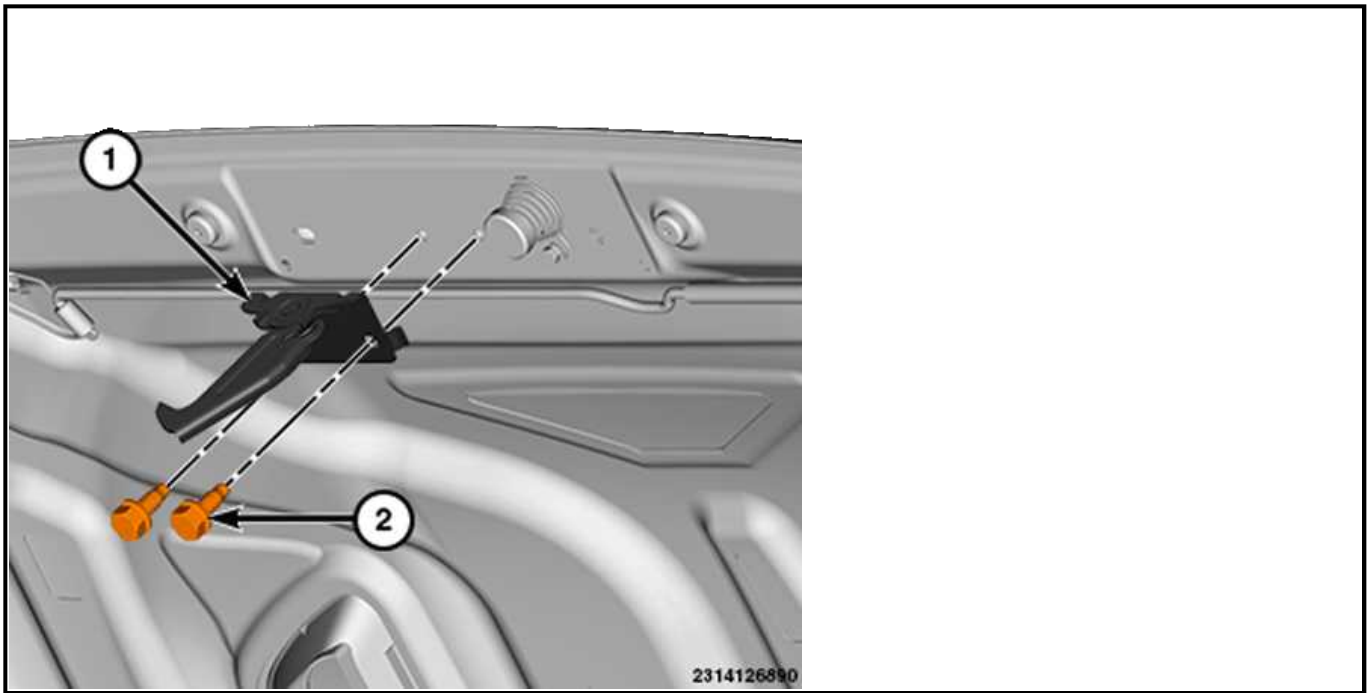
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Align the hinges with installation reference marks made previously and tighten bolts to the proper Refer to **TORQUE SPECIFICATIONS** .
- If required, adjust the hood to the correct position Refer to **GAP AND FLUSH, SPECIFICATIONS** .

LATCH, SAFETY

REMOVAL AND INSTALLATION

SAFETY LATCH



1 - Safety Catch
2 - Bolts

REMOVAL

1. Remove the bolts and remove the safety catch.

INSTALLATION

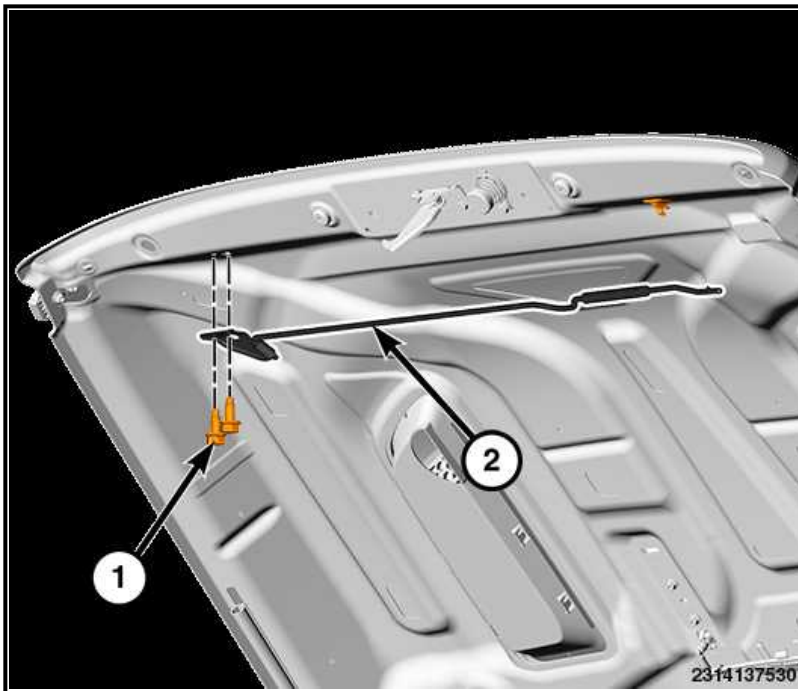
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Tighten the bolts to the proper Refer to **TORQUE SPECIFICATIONS** .

ROD, HOOD PROP

REMOVAL AND INSTALLATION

HOOD PROP ROD



1 - Bolts

2 - Hood Prop Rod

REMOVAL

1. Open the hood and support with a suitable device.
2. Remove the bolts and remove the hood prop rod.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Tighten the bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

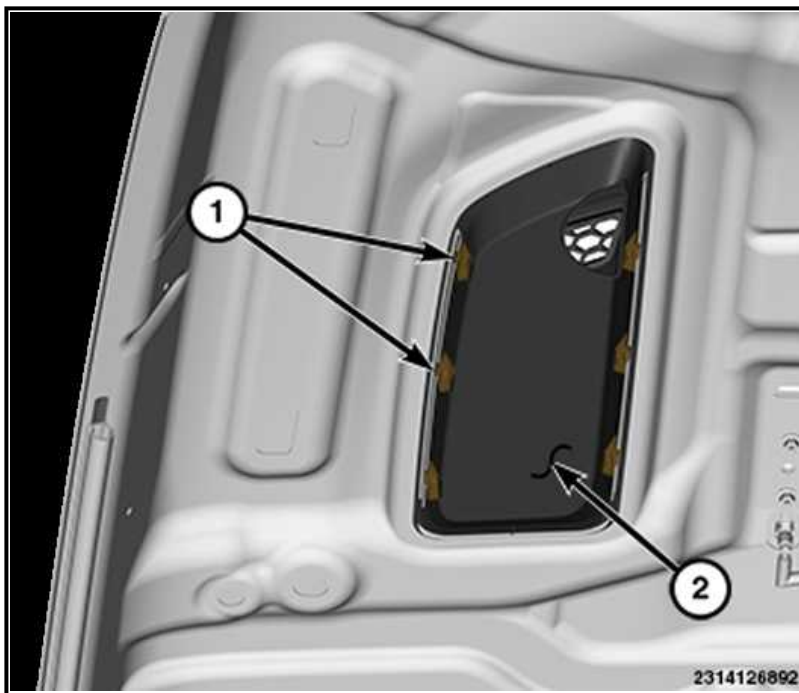
SCREEN, AIR INLET

REMOVAL AND INSTALLATION

AIR INLET SCREEN

REMOVAL

1. Open the hood.



1 - Tabs
2 - Air Inlet Screen

2. Using (special tool #C-4755, Trim Stick) or equivalent remove the hood insulator fasteners then remove the hood insulator, exposing the underside of hood and air inlet screen.
3. Using (special tool #C-4755, Trim Stick) or equivalent, press the retaining tabs securing the air inlet screen to the hood.
4. Remove the air inlet screen from hood.

INSTALLATION

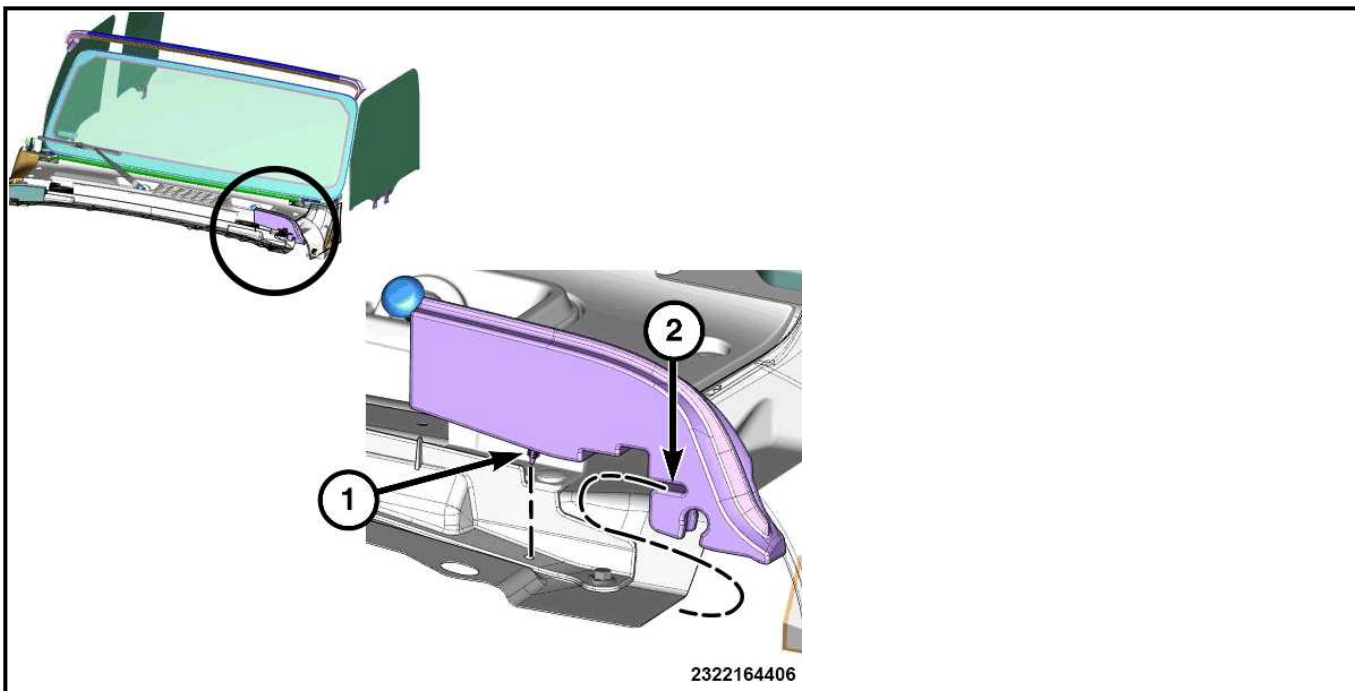
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all retaining tabs are fully seated.

SEAL, HOOD MUCKET

REMOVAL AND INSTALLATION

HOOD MUCKET SEAL



- | |
|-----------------|
| 1 - Fastener |
| 2 - Seal Groove |

REMOVAL

1. Open the hood.
2. Release the push pin fastener and remove the mucket seal.

INSTALLATION

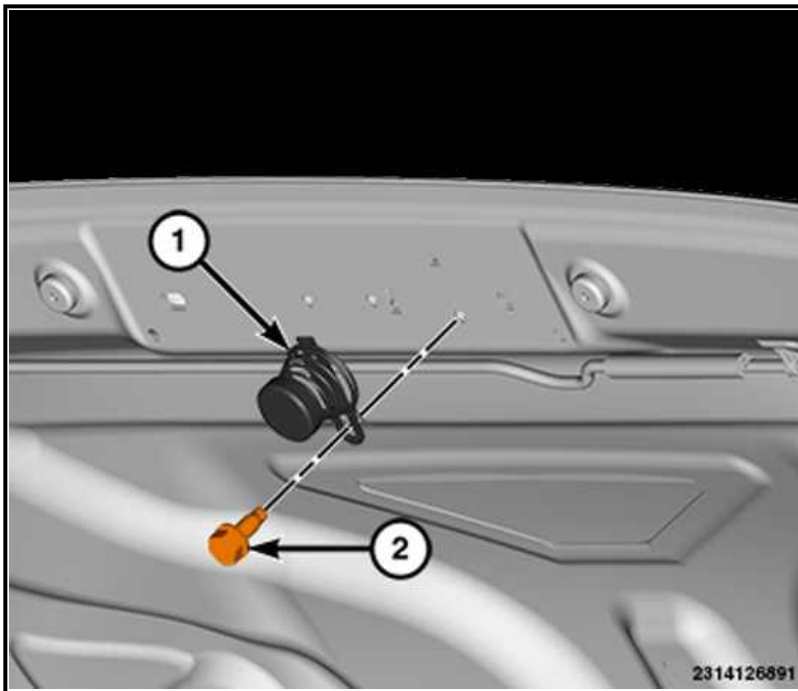
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the seal groove over the lip and seat the push pin fastener fully.

SPRING, HOOD POP UP

REMOVAL AND INSTALLATION

HOOD POP-UP SPRING



1 - Hood Spring

2 - Bolt

REMOVAL

1. Remove the bolt and remove the hood spring.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Tighten the hood spring bolt securely.

INSTRUMENT PANEL

BEZEL, INSTRUMENT CLUSTER

REMOVAL AND INSTALLATION

INSTRUMENT CLUSTER BEZEL

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the instrument panel pad. Refer to **PAD, INSTRUMENT PANEL, REMOVAL AND INSTALLATION.**



1 - Screws

2 - Bezel

3. Remove the screws along the top of bezel.
4. Using a trim stick or equivalent, disengage bezel from lower retaining clips and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.
- All fasteners are tightened securely.

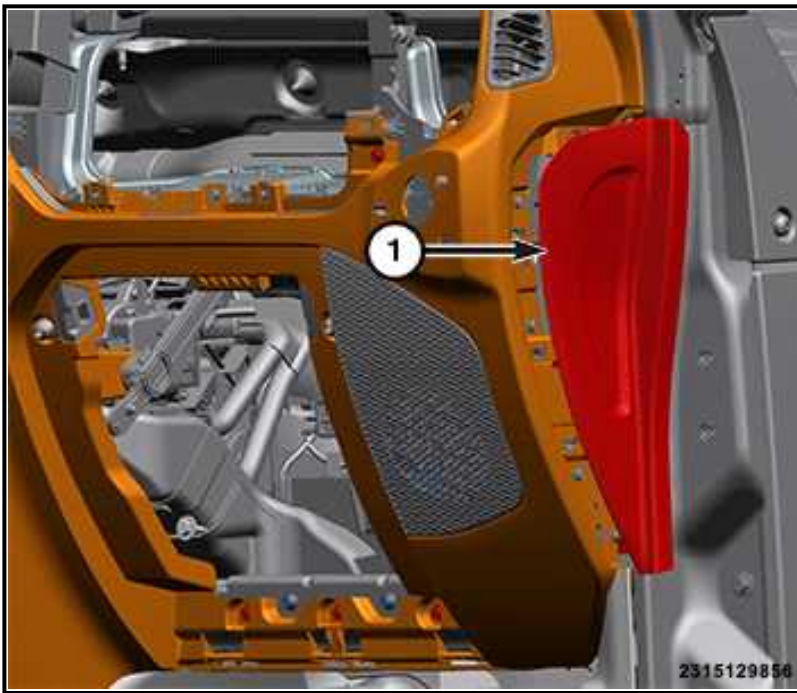
COVER, INSTRUMENT PANEL

REMOVAL AND INSTALLATION

PASSENGER SIDE

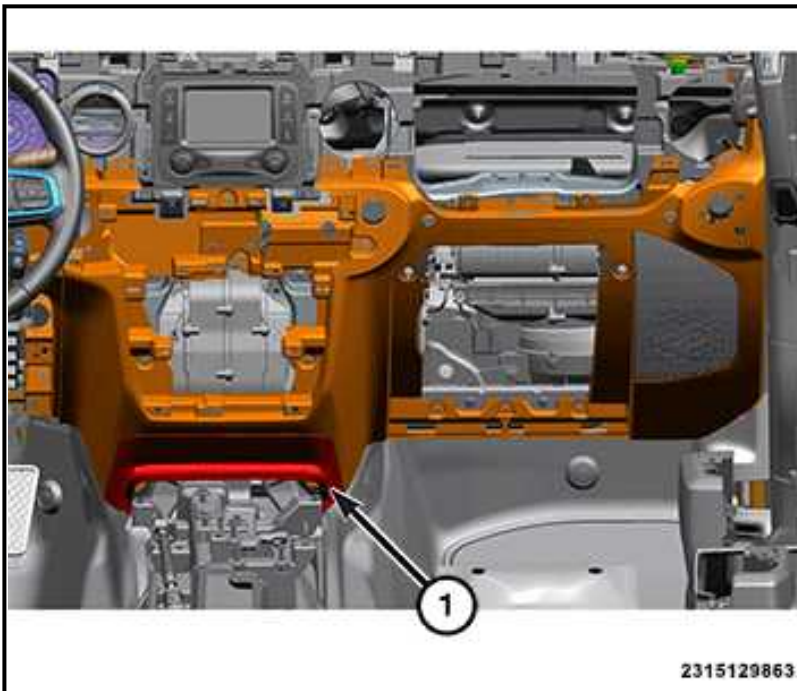
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the floor console. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) .
3. On automatic transmission vehicles, remove the shifter. Refer to [SHIFTER, TRANSMISSION, REMOVAL AND INSTALLATION](#) [SHIFTER, TRANSMISSION, REMOVAL AND INSTALLATION](#) .
4. Remove the transfer case lever. Refer to [LEVER, TRANSFER CASE, REMOVAL AND INSTALLATION](#) [LEVER, TRANSFER CASE, REMOVAL AND INSTALLATION](#) .
5. Remove the A-pillar trim panel. Refer to [PANEL, A-PILLAR TRIM, REMOVAL AND INSTALLATION](#) .



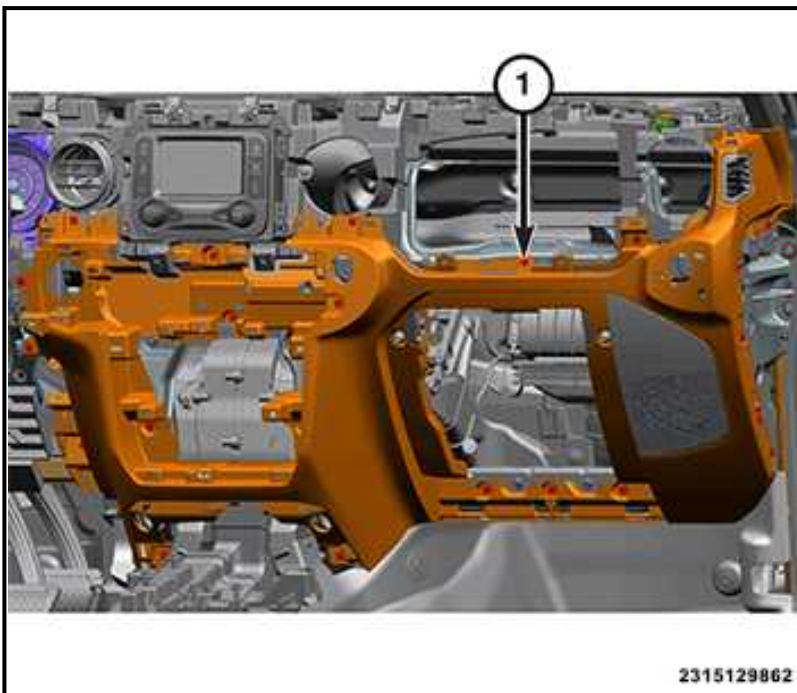
1 - End Cap

6. Using a trim stick or equivalent, remove the right side end cap.
7. Remove the glove box. Refer to [GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).
8. Remove the center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).
9. Remove the radio, if necessary. Refer to [RADIO, REMOVAL AND INSTALLATION](#).
10. Remove the passenger grab handle. Refer to [HANDLE, GRAB, REMOVAL AND INSTALLATION](#).
11. Remove the passenger air bag. Refer to [AIR BAG, PASSENGER, REMOVAL AND INSTALLATION](#).
12. Remove the cluster bezel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#).
13. Remove the steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#).
14. Remove the instrument panel passive entry antenna. Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#).
15. Route the passive entry antenna wire harness through the instrument panel cover.
16. Remove screws for steering column gap hider and slightly move forward releasing from IP cover.



1 - Bezel

17. Remove the lower instrument panel close out bezel.



1 - Screws

18. Remove the screws securing the right side cover to the IP reinforcement.

19. Disconnect the wire harness connectors and remove any necessary components, then remove the cover.

INSTALLATION

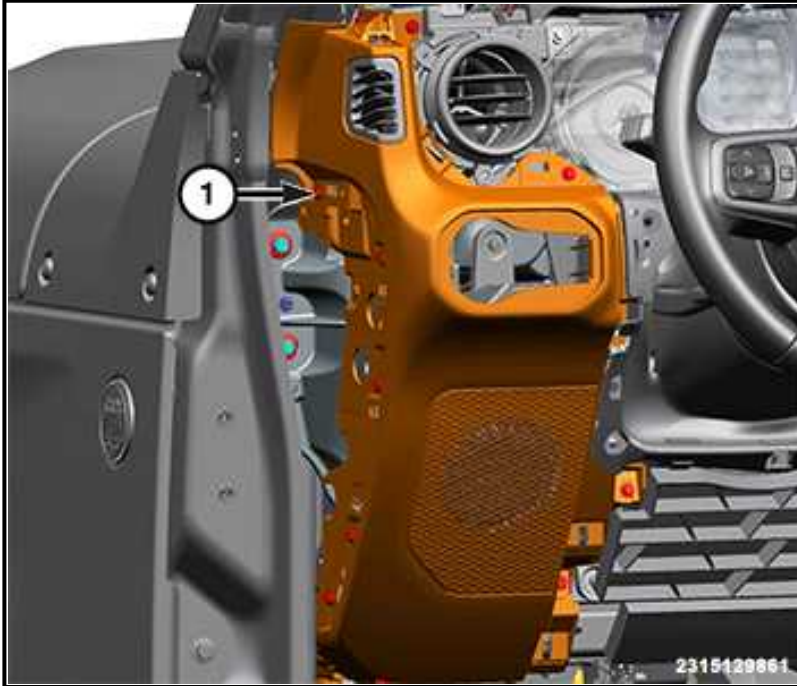
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

DRIVER SIDE

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Using a trim stick or equivalent, remove the end cap.
3. Remove the cluster bezel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#).
4. Remove the steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#).
5. Remove the screws for the steering column gap hider and move slightly forward releasing it from retainers and positioning it away from IP cover.



1 - Screws

6. Remove the screws securing the cover to the IP reinforcement, disconnect the wire harness connector and remove the cover.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

COVER, STEERING COLUMN OPENING

REMOVAL AND INSTALLATION

STEERING COLUMN OPENING COVER

REMOVAL



1 - Steering Column Opening Cover

1. Using a trim stick, separate the steering column opening cover from the IP and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.

CYLINDER, GLOVE BOX LOCK

REMOVAL AND INSTALLATION

GLOVE BOX LOCK CYLINDER

REMOVAL

1. Remove the glove box. Refer to [GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).



2. Position the glove box on a bench. Insert the key into the glove box lock cylinder and rotate to the unlocked position.



1 - Glove Box Handle
2 - Slot

3. Lift the glove box handle and insert a straight pick tool into the slot pushing in on the lock cylinder release tab.

NOTE: The last image in the removal procedure will reference the lock cylinder release tab.



1 - Lock Cylinder

4. While holding the lock cylinder release tab down with the pick tool, rotate the key counterclockwise.



1 - Lock Cylinder Release Tab

5. Remove the tool and pull up on the key. The glove box lock cylinder will come out of the handle with the key.

NOTE: The lock cylinder release tab.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

GAP HIDER, STEERING COLUMN SHROUD

REMOVAL AND INSTALLATION

STEERING COLUMN SHROUD GAP HIDER

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the steering wheel. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#) .
3. Remove the steering column shroud. Refer to [SHROUD, STEERING COLUMN, REMOVAL AND INSTALLATION](#) .
4. Remove the steering column control module. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
5. Remove steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#).
6. Remove the center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).



1 - Gap Hider

7. Remove the lower gap hider fasteners.
8. Using a trim stick or equivalent disengage gap hider retaining clips and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

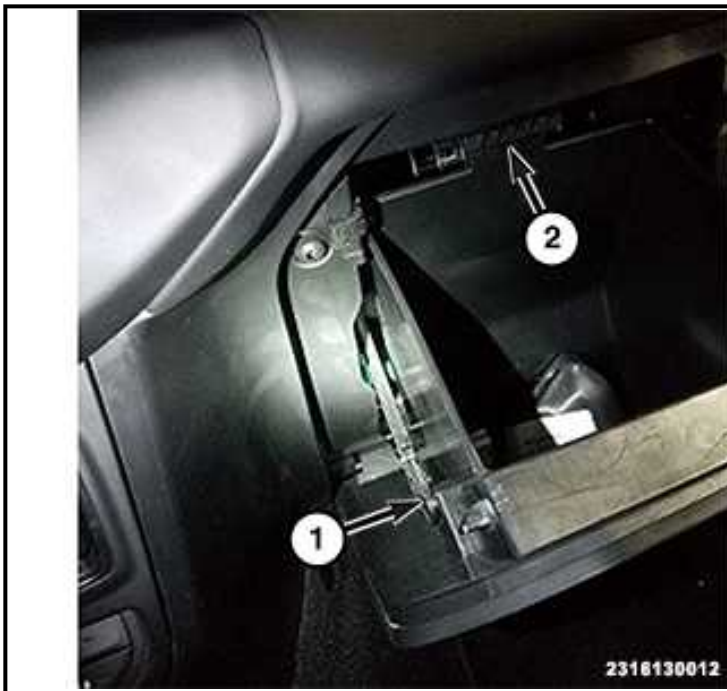
- Verify all clips are fully secured.
- All fasteners are tightened securely.

GLOVE BOX, INSTRUMENT PANEL

REMOVAL AND INSTALLATION

GLOVE BOX

REMOVAL



1 - Glove Box Damper

2 - Glove Box Stop

1. Open the glove box.
2. Disconnect the glove box damper.
3. Push up on glove box stop then rotate the glove box downward and remove.



4. If necessary to service glove box damper, rotate damper clockwise.



5. Remove damper from instrument panel.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

GRILLE, DEFROSTER

REMOVAL AND INSTALLATION

DEFROSTER GRILLE

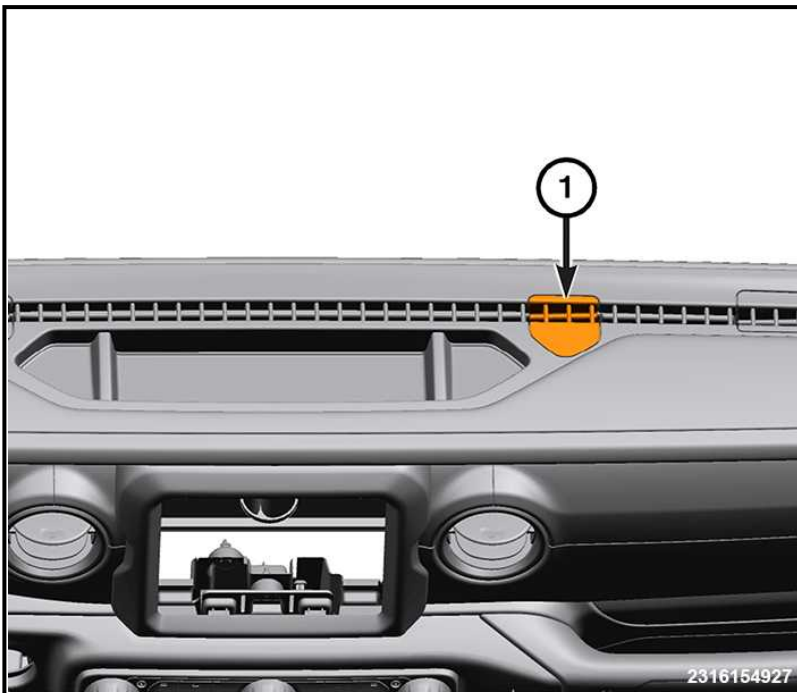
REMOVAL

1. Remove both A-pillar trim panels. Refer to [PANEL, A-PILLAR TRIM, REMOVAL AND INSTALLATION](#).
2. Remove the instrument cluster bezel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#).
3. Remove the passenger grab handle. Refer to [HANDLE, GRAB, REMOVAL AND INSTALLATION](#).
4. Remove the passenger side air bag. Refer to [AIR BAG, PASSENGER, REMOVAL AND INSTALLATION](#).



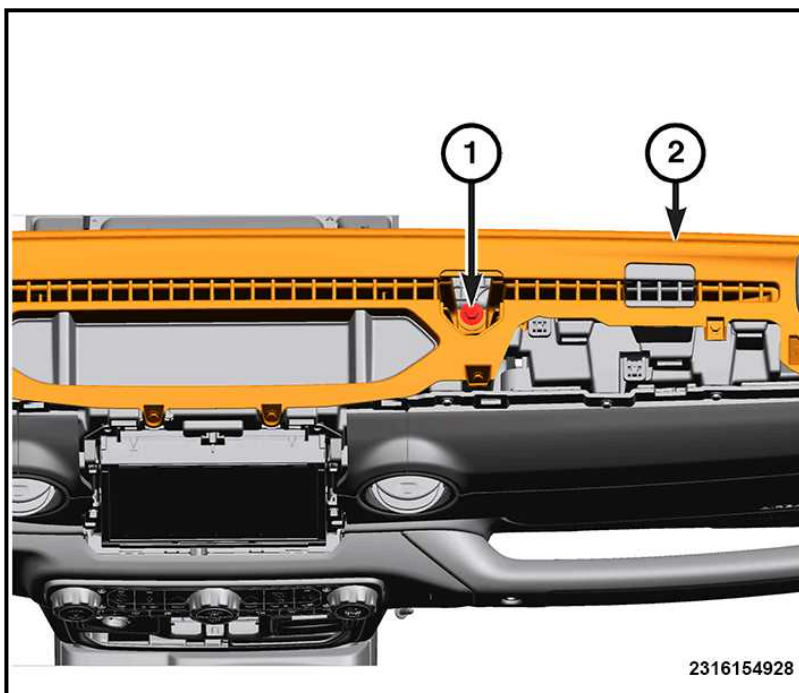
1 - Upper Storage Bin Mat

5. Remove the upper storage bin mat.
6. Remove the instrument panel speakers. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#).



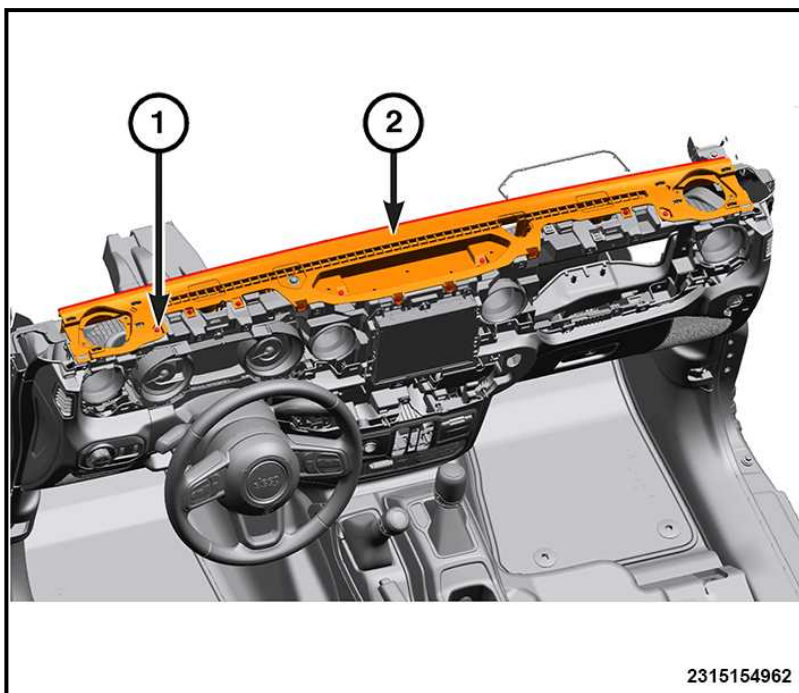
1 - Grille Defroster Fastener Access Cover

7. Using a trim stick or equivalent, remove the grille defroster fastener access cover.



1 - Bolt
2 - Defroster Grille

8. Remove the bolt from the defroster grille.



1 - Screws
2 - Defroster Grille

9. Remove the screws retaining the defroster grille.

10. Partially pull up on the defroster grille and disconnect the sun sensor wire harness connector. Remove defroster grille.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

HANDLE, GRAB

REMOVAL AND INSTALLATION

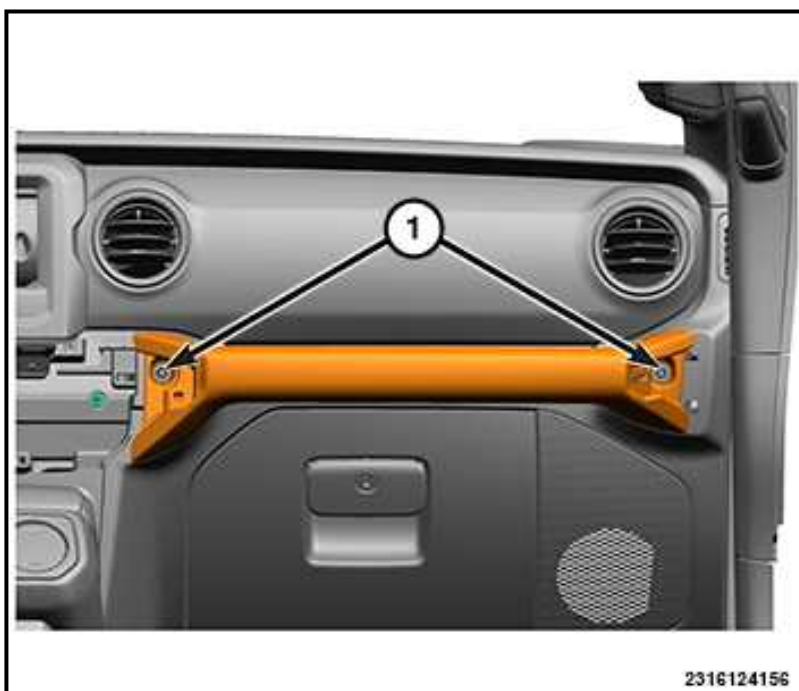
GRAB HANDLE

REMOVAL



- | |
|----------------------------|
| 1 - Upper Center Stack |
| 2 - Grab Handle Trim Cover |

1. Remove the upper center stack. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).
2. Remove the grab handle trim cover.



1 - Bolts

3. Remove the grab handle mounting bolts and remove handle.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Bolts are tightened securely.

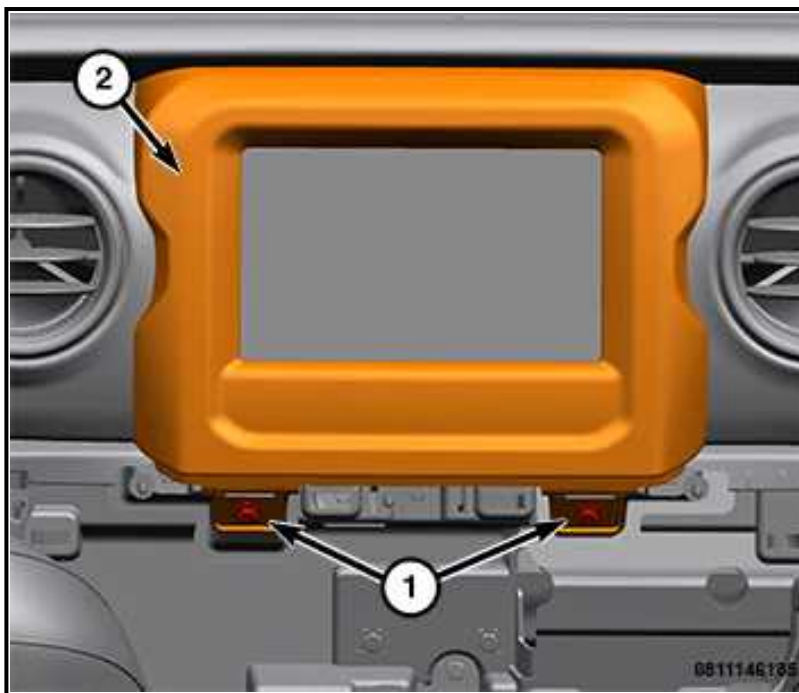
PAD, INSTRUMENT PANEL

REMOVAL AND INSTALLATION

INSTRUMENT PANEL PAD

REMOVAL

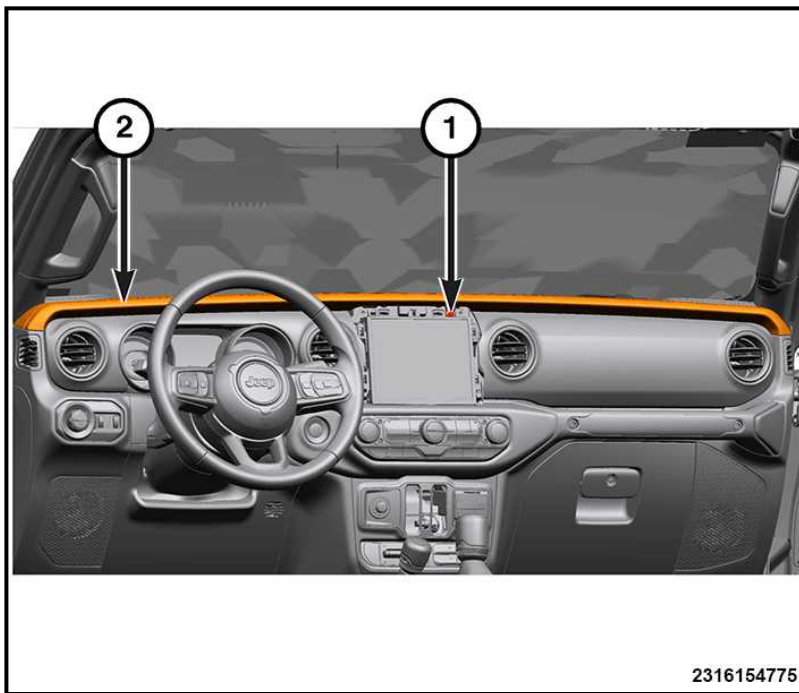
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the upper center stack. Refer to PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION.



1 - Screws

2 - Radio Bezel

3. Remove the screws then use a trim stick or equivalent to release the radio bezel and remove.



1 - Screw
2 - Dash Pad

4. Remove the screw then use a trim stick or equivalent to release the retaining clips for the dash pad and pull forward and out.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All screws are tightened securely.

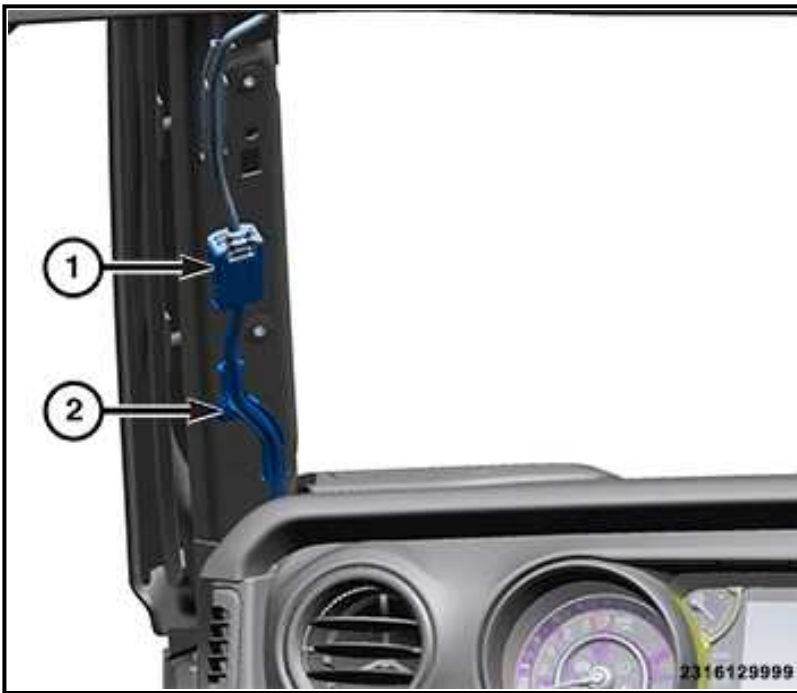
PANEL, INSTRUMENT

REMOVAL AND INSTALLATION

INSTRUMENT PANEL

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the floor console. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#)[CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#).
3. On automatic transmission vehicles, remove the shifter. Refer to [SHIFTER, TRANSMISSION, REMOVAL AND INSTALLATION](#) [SHIFTER, TRANSMISSION, REMOVAL AND INSTALLATION](#) .
4. Remove the transfer case lever. Refer to [LEVER, TRANSFER CASE, REMOVAL AND INSTALLATION](#) [LEVER, TRANSFER CASE, REMOVAL AND INSTALLATION](#) .
5. Remove the manual park release assembly. Refer to [LEVER, MANUAL PARK RELEASE, REMOVAL AND INSTALLATION](#) [LEVER, MANUAL PARK RELEASE, REMOVAL AND INSTALLATION](#) .
6. Remove the A-pillar trim. Refer to [PANEL, A-PILLAR TRIM, REMOVAL AND INSTALLATION](#).

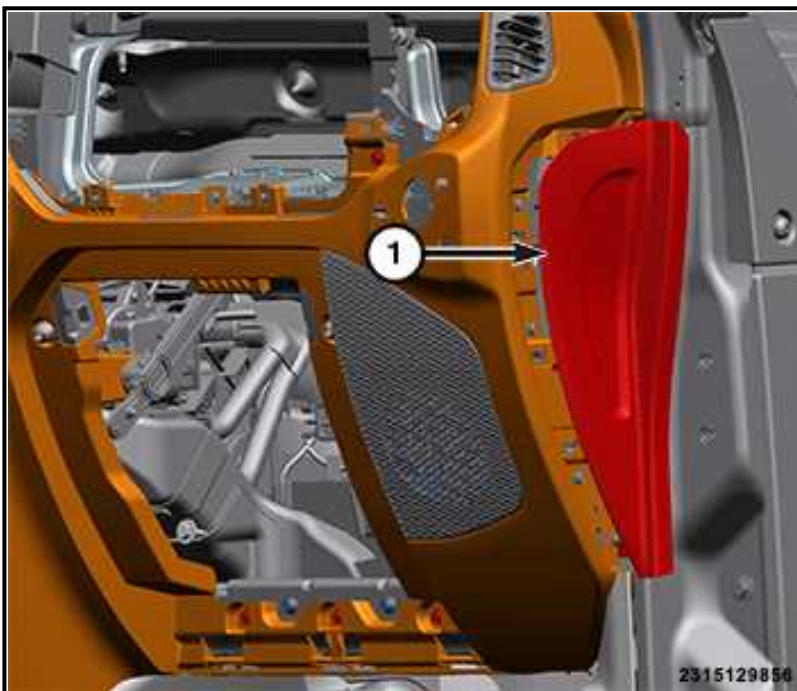


1 - Wire Harness Connector

2 - Wire Harness Retainer

NOTE: Left side as shown in illustration, right side similar.

7. Disconnect the wire harness connector and release the harness retainer from the A-pillar.
8. Remove the instrument panel center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).
9. Remove steering column. Refer to [COLUMN, REMOVAL AND INSTALLATION](#).

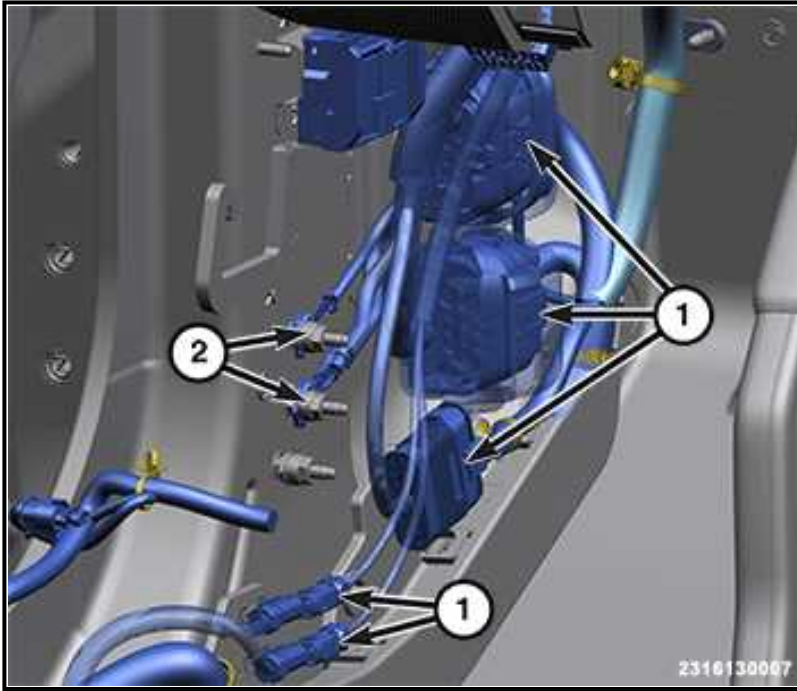


1 - End Cap

NOTE: Right side as shown in illustration, left side similar.

10. Using a trim stick or equivalent, remove the end caps.

11. Remove the front cowl trim panel. Refer to [PANEL, COWL TRIM, REMOVAL AND INSTALLATION](#).

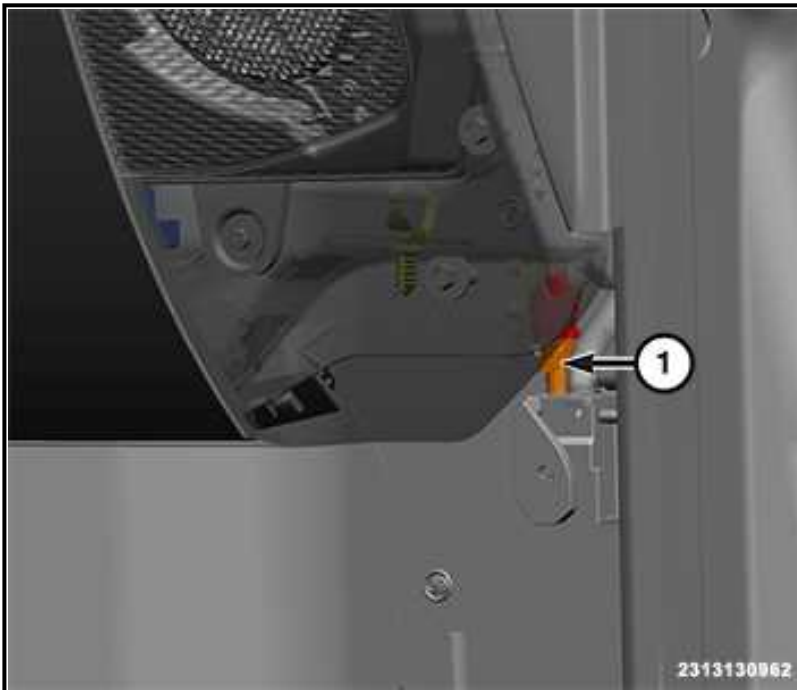


1 - Wire Harness Connectors

2 - Ground Wires

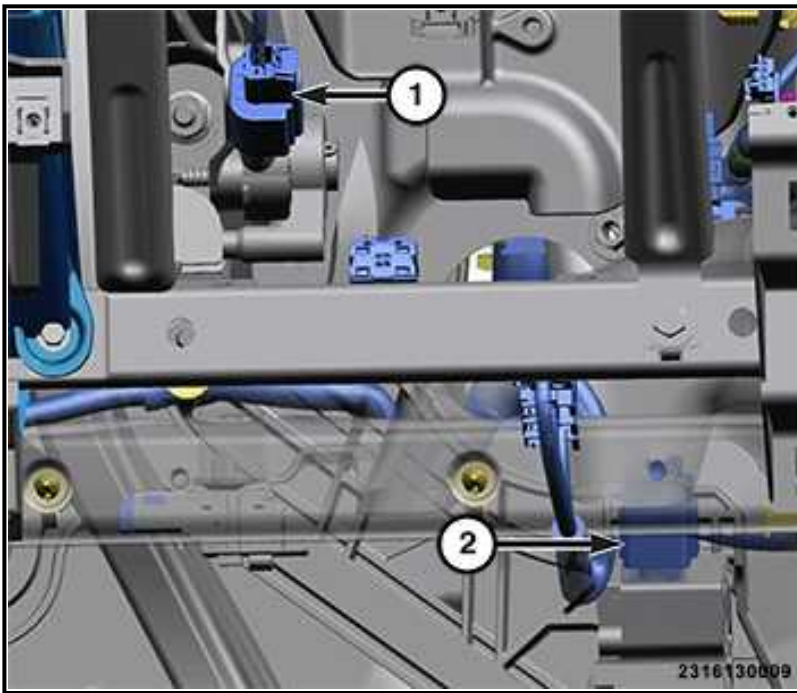
NOTE: Left side as shown in illustration, right side similar.

12. Disconnect the wire harness connectors at the floor on both left and right sides of the vehicle.
13. Remove the ground wires on left and right sides.



1 - Antenna Connector

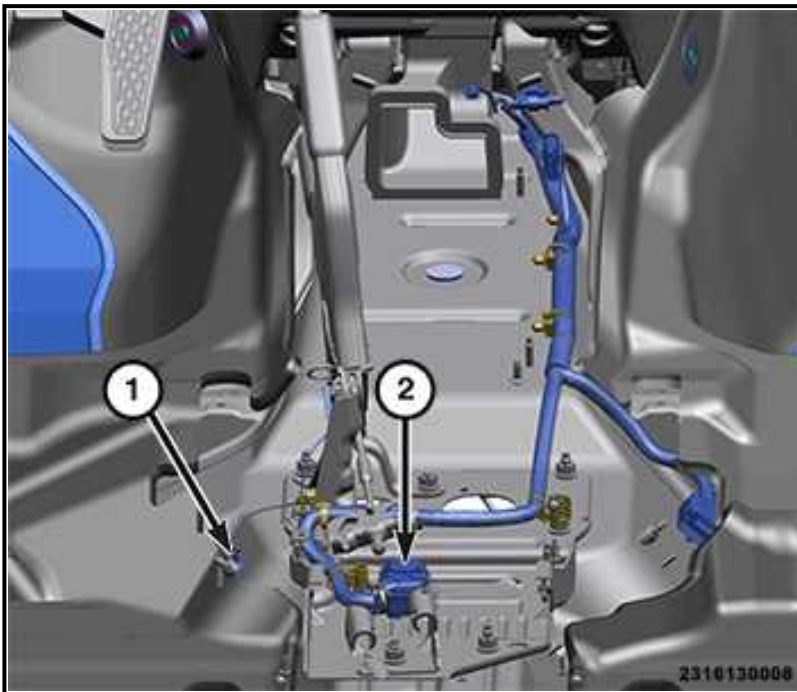
14. Disconnect the antenna connector on right side near the floor.



1 - Brake Light Switch Wire Harness Connector

2 - Accelerator Pedal Wire Harness Connector

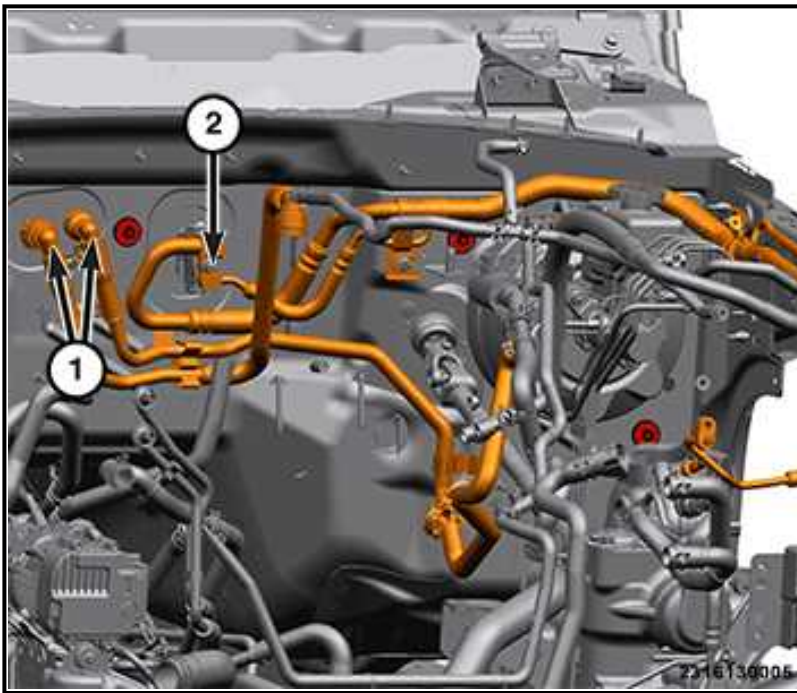
15. Disconnect the accelerator pedal wire harness connector.
16. Disconnect the brake light switch wire harness connector.



1 - Ground Wire

2 - Wire Harness Connectors

17. Disconnect the center IP wire harness connectors and ground wire.
18. Recover the refrigerant. Refer to [PLUMBING, STANDARD PROCEDURE](#) .
19. Drain the coolant (Refer to the appropriate service information).
20. Remove the engine cover. Refer to [COVER, ENGINE, REMOVAL AND INSTALLATION COVER, ENGINE, REMOVAL AND INSTALLATION](#) .



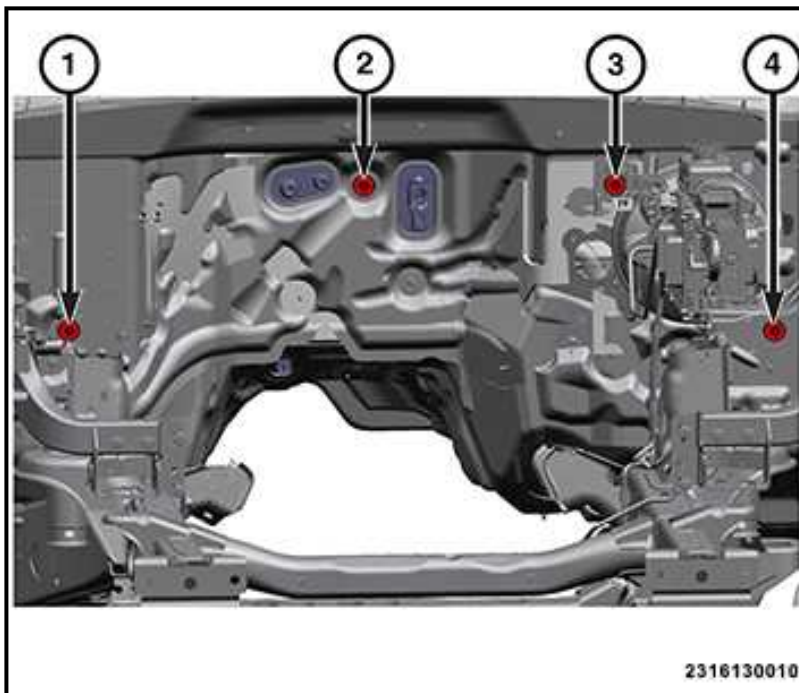
1 - Quick Disconnect Hoses
2 - Nut

21. Disconnect the quick connect hoses from the tubes. Install plugs in, or tape over the opened heater core tubes to prevent coolant spillage during the HVAC housing removal.
22. Remove the nut securing the A/C liquid line and A/C suction line to the A/C expansion valve.
23. Disconnect the A/C liquid and suction lines from the A/C expansion valve.
24. Install plugs in or tape over the open refrigerant line fittings and the expansion valve ports.

NOTE:

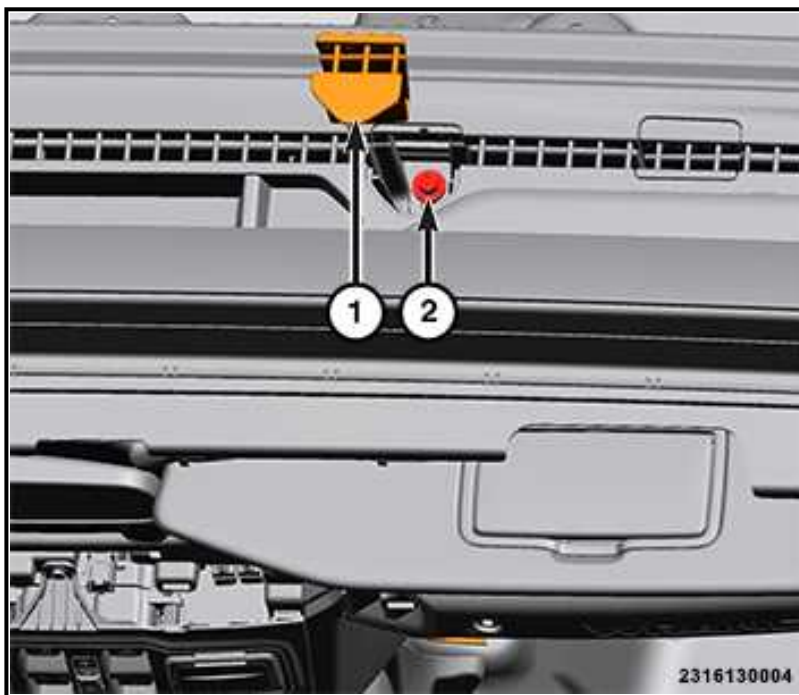
Not necessary to completely remove the washer reservoir and coolant reservoir, just to reposition to gain access.

25. Remove the coolant bottle fasteners and reposition coolant bottle. Refer to [BOTTLE, PRESSURIZED COOLANT, REMOVAL AND INSTALLATION](#) [BOTTLE, PRESSURIZED COOLANT, REMOVAL AND INSTALLATION](#).
26. If equipped with 3.0L diesel, remove the washer reservoir fasteners and reposition the washer reservoir. Refer to [RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION](#).



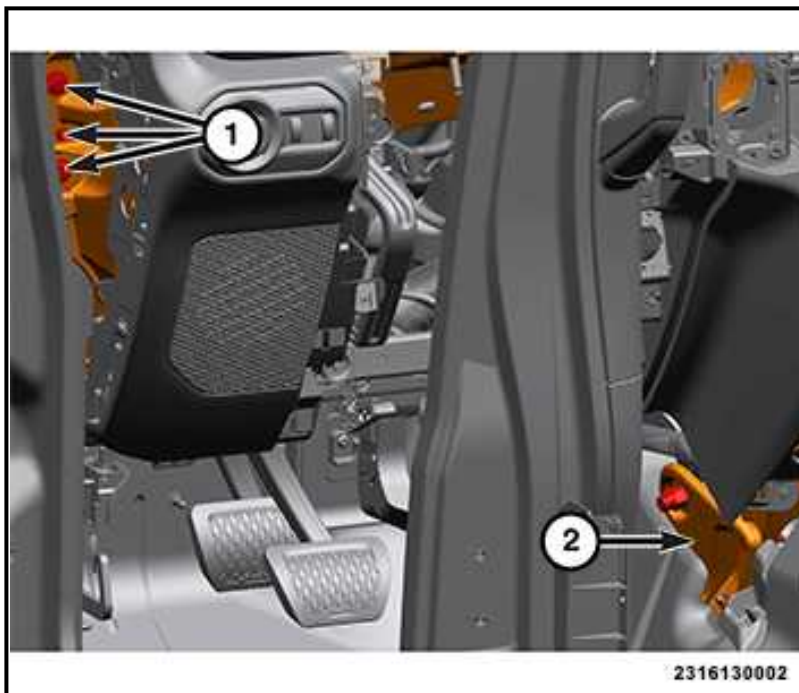
1 - Bolt on Passenger Side
2 - Bolt by Heater Core Lines
3 - Bolt next to Brake Booster
4 - Bolt under the Brake Booster

27. Remove the bolt on passenger side of the engine compartment.
28. Remove the bolt by the heater core lines.
29. Remove the bolt located next to the brake booster.
30. Remove the bolt under the brake booster.



1 - Trim Cap
2 - Bolt

31. Remove the trim cap and remove the fenceline bolt.



1 - Bolts
2 - Center Support Brackets

NOTE: Left side as shown in illustration, right side similar.

32. Remove the bolt and nut for the center support brackets and then remove bracket.
33. Remove the side support bolts and position the IP assembly.
34. Remove the IP and HVAC housing from the vehicle.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Position the IP assembly into the vehicle and support the rear of the IP.
- Position the IP assembly and carefully push the heater core lines and expansion valve through the cowl.
- Position the IP over the fenceline and loosely install bolt.
- Loosely install the side support bolts.
- Install the center support brackets over the studs and install the bolts and nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the side support bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten the fenceline bolts to the proper and install the bolt cover. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the bulkhead to instrument panel bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Install the nut that secures the A/C liquid and suction lines to the A/C expansion valve. Tighten the nut to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Tighten all other fasteners securely.
- Fill the cooling system (Refer to 09 - Engine/Cooling Systems/Low Temp Cooling/Standard Procedure).
- Charge the refrigerant system. Refer to [PLUMBING, STANDARD PROCEDURE](#) .

PANEL, INSTRUMENT PANEL TRIM

REMOVAL AND INSTALLATION

CENTER TRIM

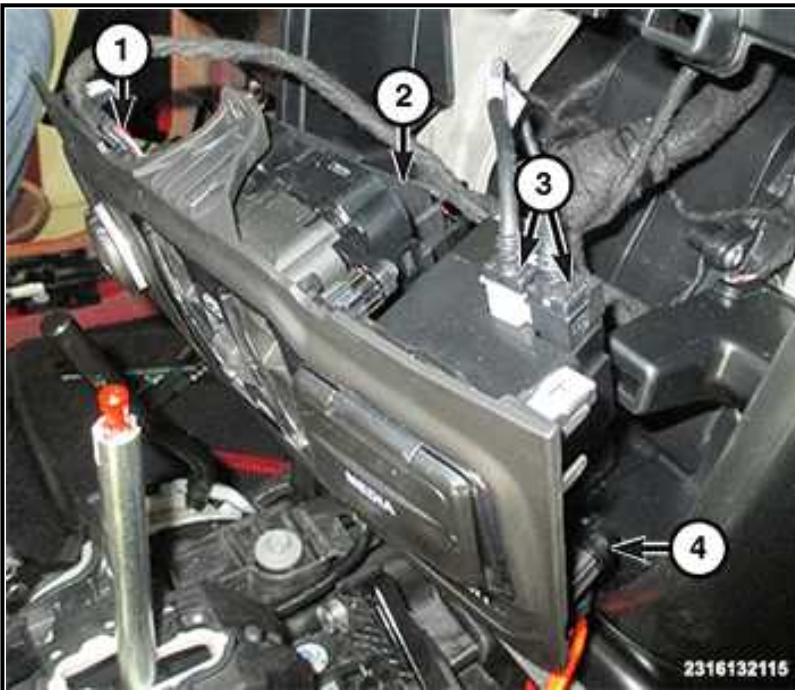
REMOVAL

1. Remove the Integrated Center Stack (ICS) and upper instrument panel center trim as an assembly. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .



1 - Screw

2. Remove the screw from the lower instrument panel center trim, then firmly grab the lower trim and carefully pull the trim back to release the retaining clips.



- | |
|--|
| 1 - Power Outlet Wire Harness Connector |
| 2 - Power Window Switch Wire Harness Connector |
| 3 - Media Hub Wire Harness Connectors |
| 4 - Auxiliary Switch Bank Wire Harness Connector |

3. Disconnect the power outlet wire harness connector.
4. Disconnect the power window switch wire harness connector.
5. Disconnect the media hub wire harness connectors.
6. If equipped, disconnect the auxiliary switch bank wire harness connector.
7. If equipped, disconnect the Off Road Switch wire harness connector.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.
- All fasteners are tightened securely.

RIGHT SIDE TRIM

Right side trim panel is removed as a assembly with passenger side air bag. Refer to [AIR BAG, PASSENGER, REMOVAL AND INSTALLATION](#) .

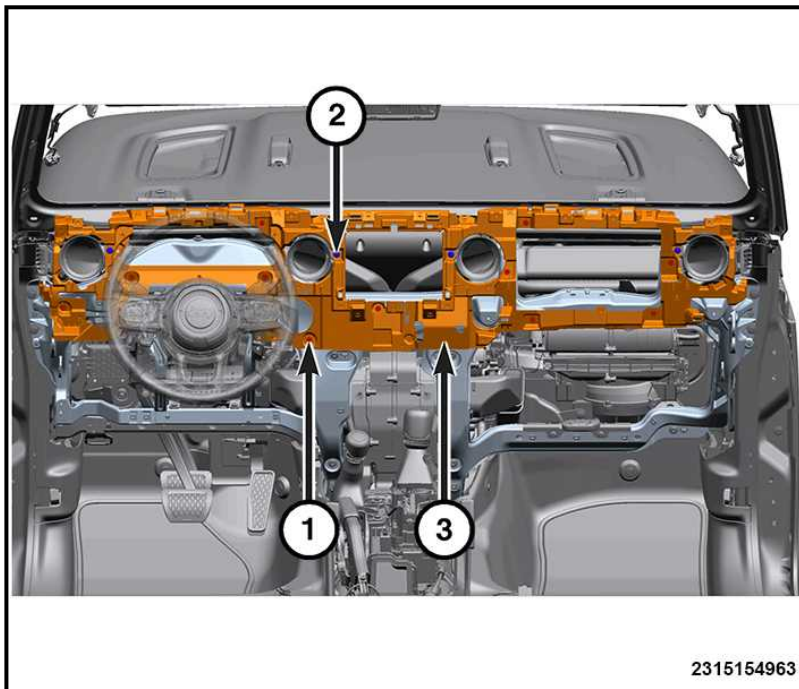
RETAINER, INSTRUMENT PANEL

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

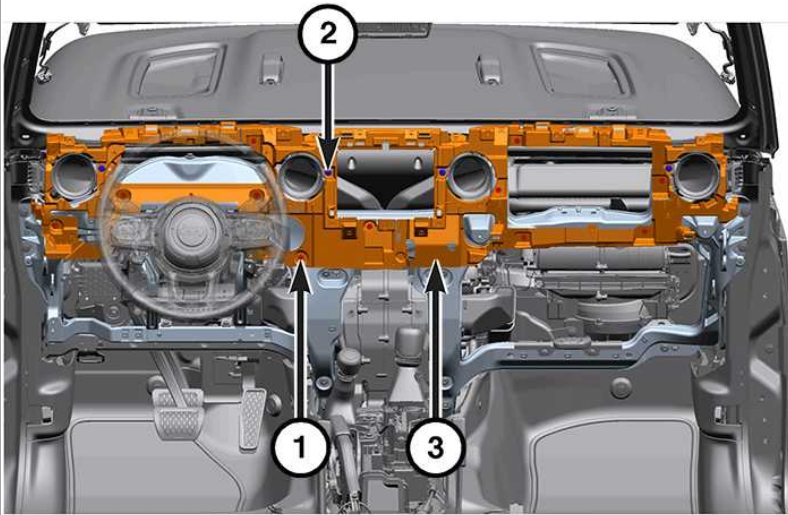
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the driver side and passenger side Instrument Panel (IP) covers. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).



3. Remove the screws (1) from the IP retainer (3).
4. Remove the screws (2) that retain the air ducts to the IP retainer (3).
5. Remove the IP retainer (3) from vehicle.

INSTALLATION



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1. Position the Instrument Panel (IP) retainer (3) to the IP carrier
2. Install the screws (1) for the IP retainer and tighten securely.
3. Install the screws (2) for the air duct and tighten securely.
4. Install the driver side and passenger side IP covers. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to the appropriate service information .

INTERIOR

ARMREST, FRONT CENTER CONSOLE

REMOVAL AND INSTALLATION

ARMREST

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the floor console end cap. Refer to [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#).



1 - Screws

3. Remove the two screws and the HVAC outlet duct.



1 - Screws
2 - Wire Harness Retaining Clip

4. Disconnect the wire harness retaining clip and position the wire harness aside.
5. Remove the five screws at the rear of the armrest and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Tighten the screws securely.

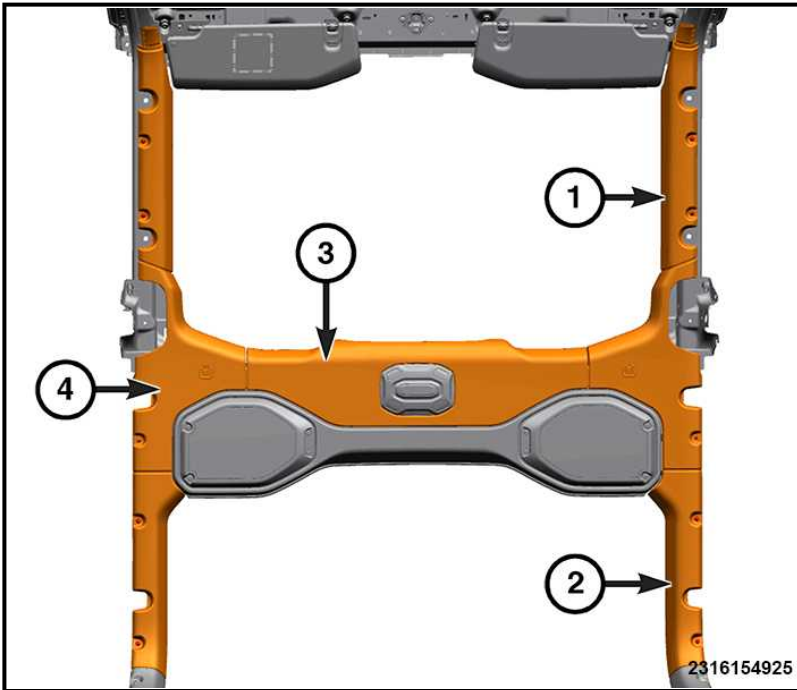
BAR, SPORT, SPEAKER POD

REMOVAL AND INSTALLATION

SPORT BAR SPEAKER POD

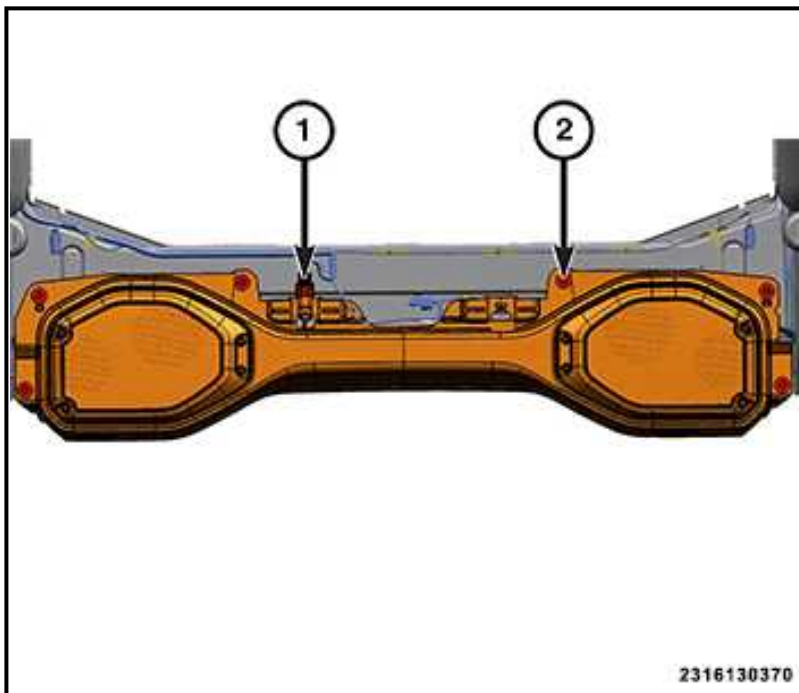
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the dome lamp. Refer to [LAMP, DOME, REMOVAL AND INSTALLATION](#) .



- | |
|--------------------------------|
| 1 - Front Door Sport Bar Cover |
| 2 - Rear Door Sport Bar Cover |
| 3 - Center Sports Bar Cover |
| 4 - Sport Bar Cover |

3. Remove the screws from the driver and passenger side front door sport bar covers. Remove both trim covers from vehicle.
4. Remove the screws from the driver and passenger side rear door sport bar covers. Remove both trim covers from vehicle.
5. Remove the screws from the center sport bar cover. Remove center sport bar cover from vehicle.
6. Remove the wire harness fasteners.
7. Remove the screw and plastic fastener from the driver and passenger side sport bar cover. Using a trim stick of equivalent, remove both trim covers from vehicle.



1 - Wire Harness Connector

2 - Bolts

8. Disconnect the wire harness connector, remove the bolts and lower the speaker pod.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

BEZEL, SHIFTER

REMOVAL AND INSTALLATION

SHIFTER BEZEL



1 - Gear Shifter Boot

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Using a trim tool, separate the gear shifter boot from the bezel.



1 - Screw

3. Position the gear shifter boot so you can remove the screw, then remove the gear shift knob and boot assembly.



1 - Shifter Bezel

4. Using a trim tool, separate the shifter bezel from the floor console.
5. Lift the shifter bezel, disconnect the wire harness connector and remove the shifter bezel.

INSTALLATION

- The screw is tightened securely.

REMOVAL AND INSTALLATION

REMOVAL

WITHOUT LID

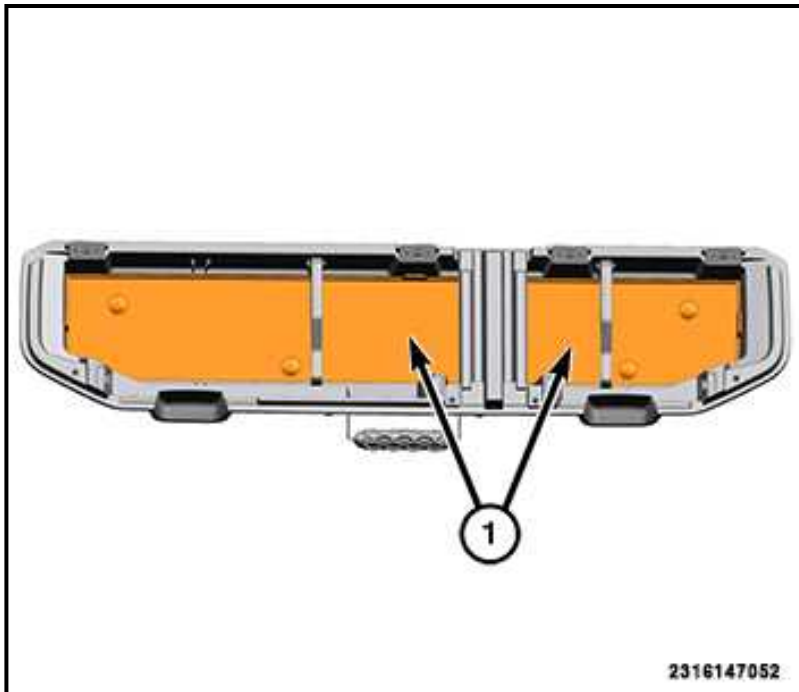
-

- WITH LID

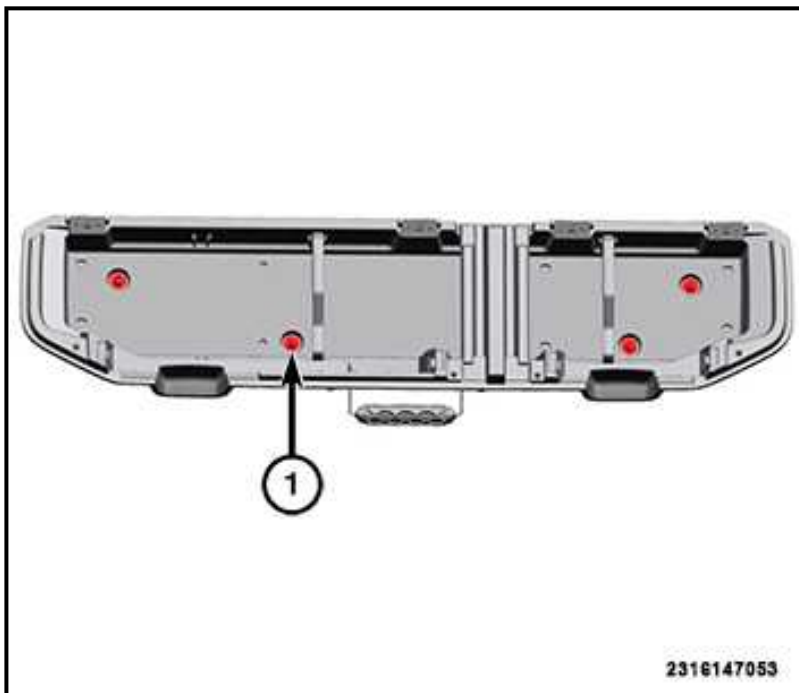
3. Raise the rear lower seat.



4. Lift up on both handles to release the storage bin lids.



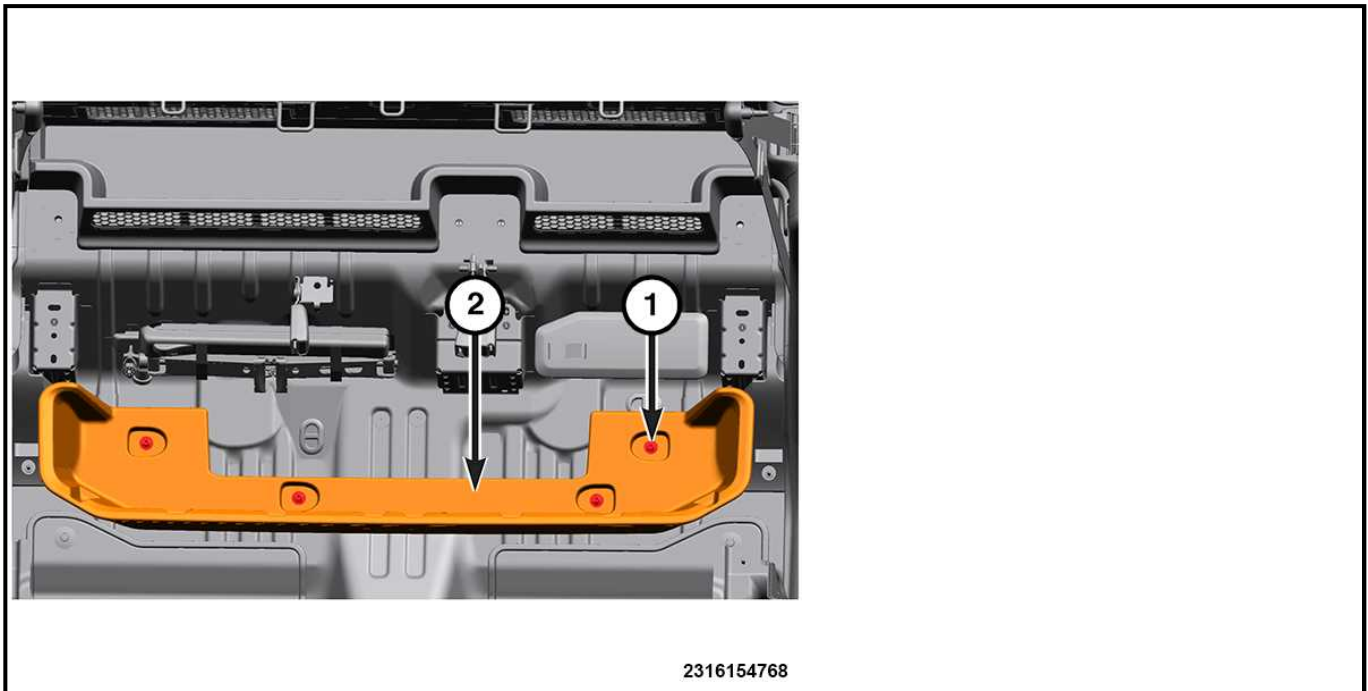
5. Remove both storage bin liners (1).



6. Remove the four fasteners (1) that secure the storage bin and remove the storage bin.

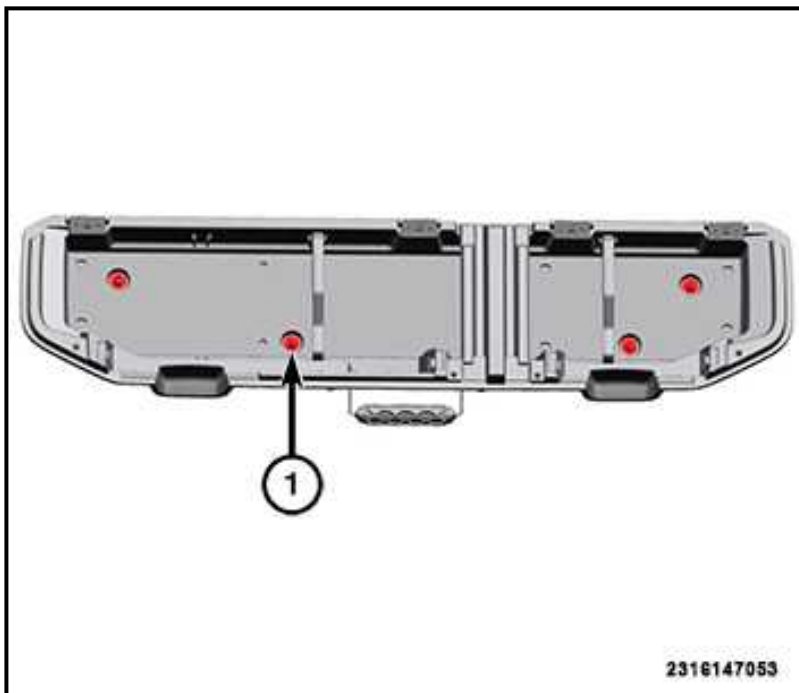
INSTALLATION

WITHOUT LID



1. Position the storage bin (2) on the floor panel and install the four fasteners (1) and tighten to the proper. Refer to **TORQUE SPECIFICATIONS**.
2. Lower the rear seat.

WITH LID

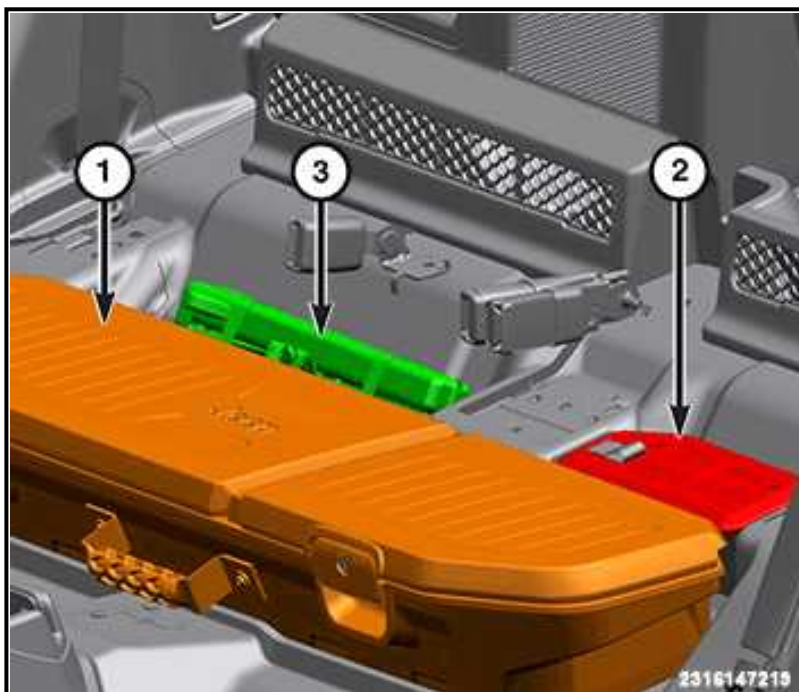


3. Position the storage bin on the floor panel and install the four fasteners (1) and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
4. Install the storage bin liners.
5. Close the storage bin lid and lower the rear seat.

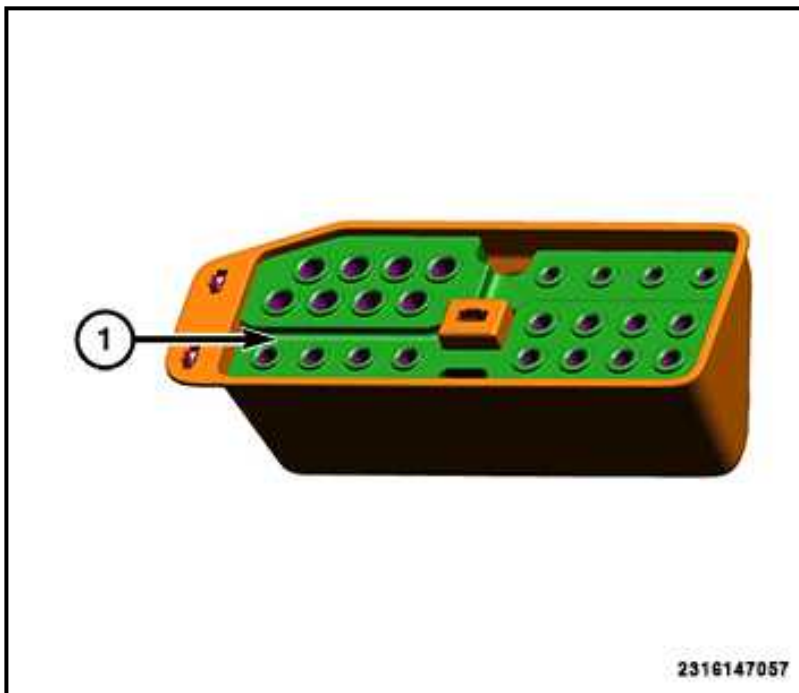
FASTENER

REMOVAL

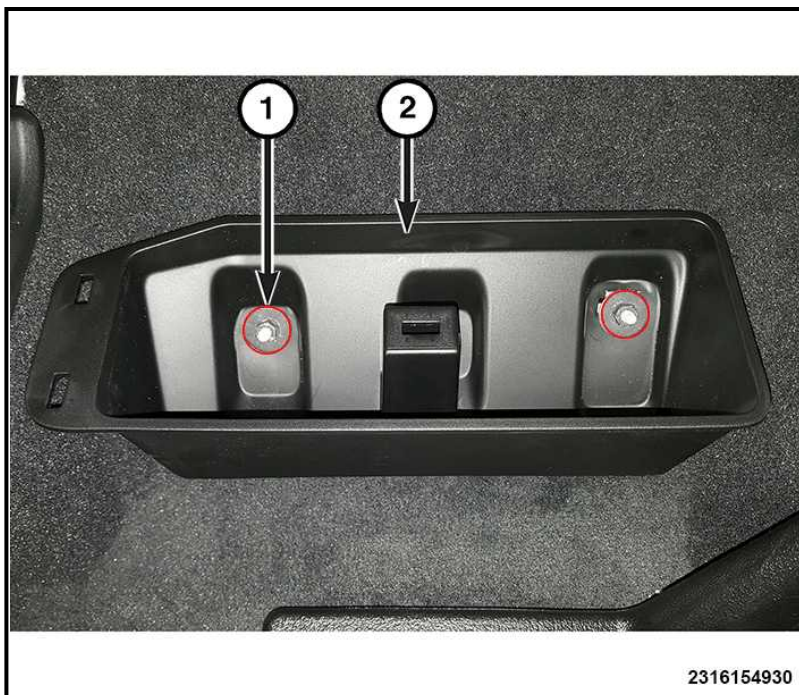
1. Lift up the rear lower seat.



2. The fastener storage bin (2) is located under driver side rear lower seat.



3. Lift up on the storage bin lid strap to open bin and remove the fastener insert (1) from the storage bin.



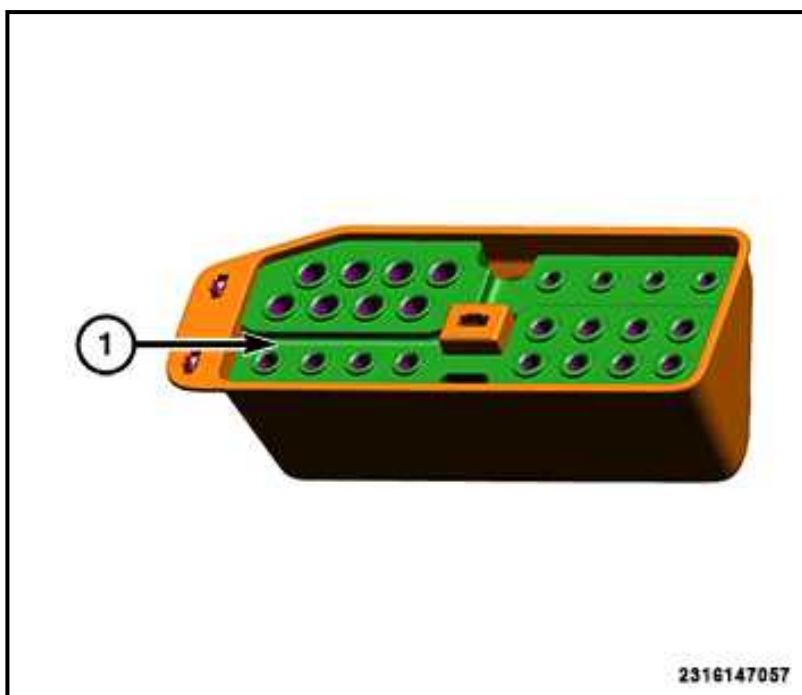
4. Remove the two nuts (1), release the center retainer and remove the fastener bin (2).

INSTALLATION



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1. Position the storage bin (2) to the floor panel pressing the bin until the center retaining clip is fully inserted into the storage bin.
2. Install the two nuts (1) and tighten them securely.



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3. Install the fastener insert (1) into the storage bin.
4. Close the fastener storage bin lid and lower the rear seat.

CARPET, FRONT FLOOR

REMOVAL AND INSTALLATION

FRONT CARPET

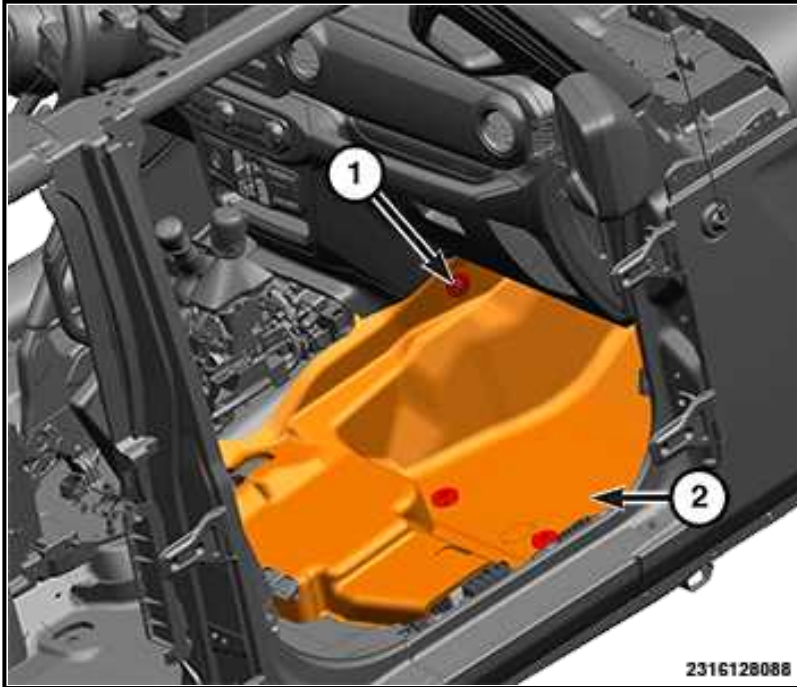
NOTE:

The front floor carpet is two pieces, and can be serviced individually.

The right side carpet is shown in this procedure, and is similar steps for the left side carpet.

REMOVAL

1. Remove the front seat for the side being serviced. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) .
2. Slide out the carpet from underneath the floor console.
3. Slide out the carpet from underneath the cowl trim panel for the side being worked on.
4. Slide out the carpet from underneath the lower B-pillar trim panel.



1 - Stud Caps
2 - Carpet

5. Remove the stud caps and remove the carpet.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

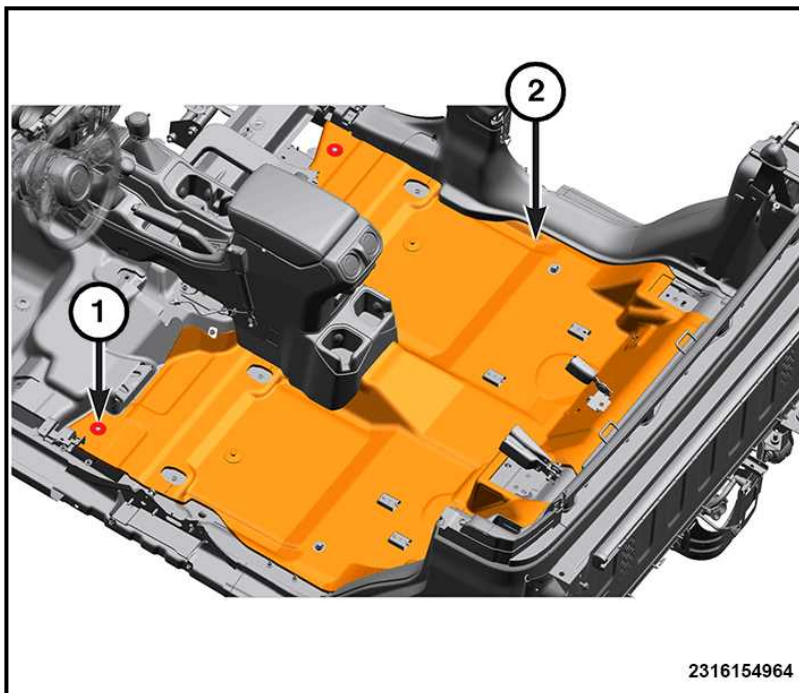
CARPET, REAR FLOOR

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Remove the front seats. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).
2. Raise the rear lower seats.
3. Remove the rear storage bin. Refer to [BIN, STORAGE, REMOVAL AND INSTALLATION](#).
4. Remove the fastener bin. Refer to [BIN, STORAGE, REMOVAL AND INSTALLATION](#).
5. Remove the jack assembly.
6. Slide the rear carpet out from under the rear cab panel trim, quarter trim, lower B-pillar trim, and the floor console.



7. Remove the stud caps (1) and remove the rear carpet (2).

INSTALLATION

1. Install the rear carpet and stud caps.
2. Tuck the rear carpet under the rear cab panel trim, quarter trim, lower B-pillar trim, and the floor console.
3. Install the fastener bin. Refer to [BIN, STORAGE, REMOVAL AND INSTALLATION](#).
4. Install the rear storage bin. Refer to [BIN, STORAGE, REMOVAL AND INSTALLATION](#).
5. Install the jack assembly.
6. Lower the rear seats.
7. Install the front seats. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) .

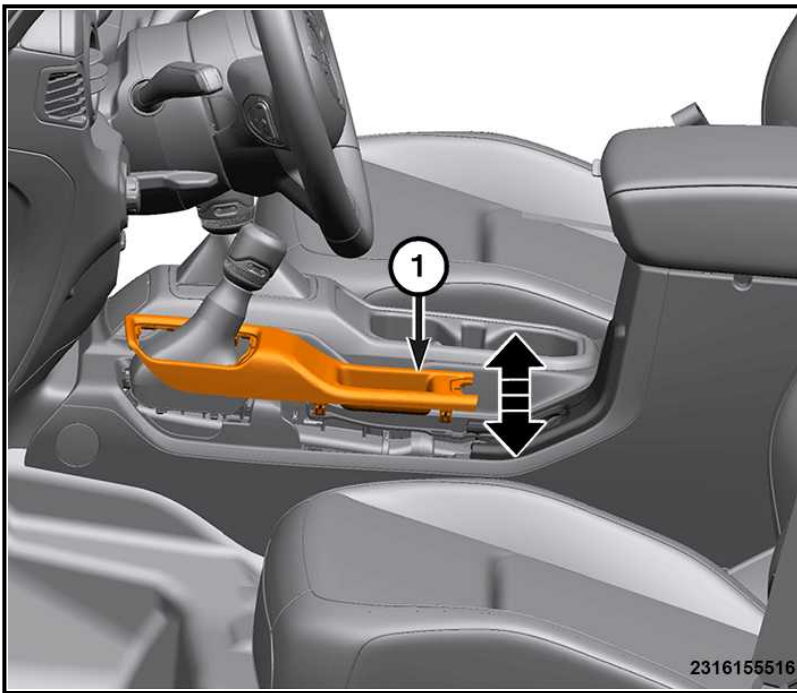
CONSOLE, FLOOR

REMOVAL AND INSTALLATION

FLOOR CONSOLE

REMOVAL

1. Remove the transfer case shifter handle. Refer to [HANDLE, REMOVAL AND INSTALLATION](#) [HANDLE, REMOVAL AND INSTALLATION](#) .



1 - Transfer Case Shifter Bezel

2. Using a trim tool or equivalent, release the retaining clips and remove the transfer case shifter bezel.

NOTE: Be sure not to pry on the parking brake gap hider, it is molded to the console and not part of the transfer case shifter bezel.

3. Remove the shifter bezel. Refer to [BEZEL, SHIFTER, REMOVAL AND INSTALLATION](#).



1 - Bolt

4. Remove the front bolt covers and the bolts on both sides of the console.
5. Move the front seats to the full forward position.



1 - Bolt

6. Remove the rear bolt covers and the bolts on both sides of the console.
7. Remove the front fasteners and loosen the rear fasteners from the front passenger seat to rock the seat back to gain access to the wire harness connectors.



1 - Wire Harness Connectors

8. Disconnect the wire harness connectors under the front passenger seat.

NOTE: Be careful when removing the floor console to avoid damage to neighboring components.

9. Remove the console from the vehicle with the shifter in the neutral position and lift from the back and slide out towards rear of vehicle.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

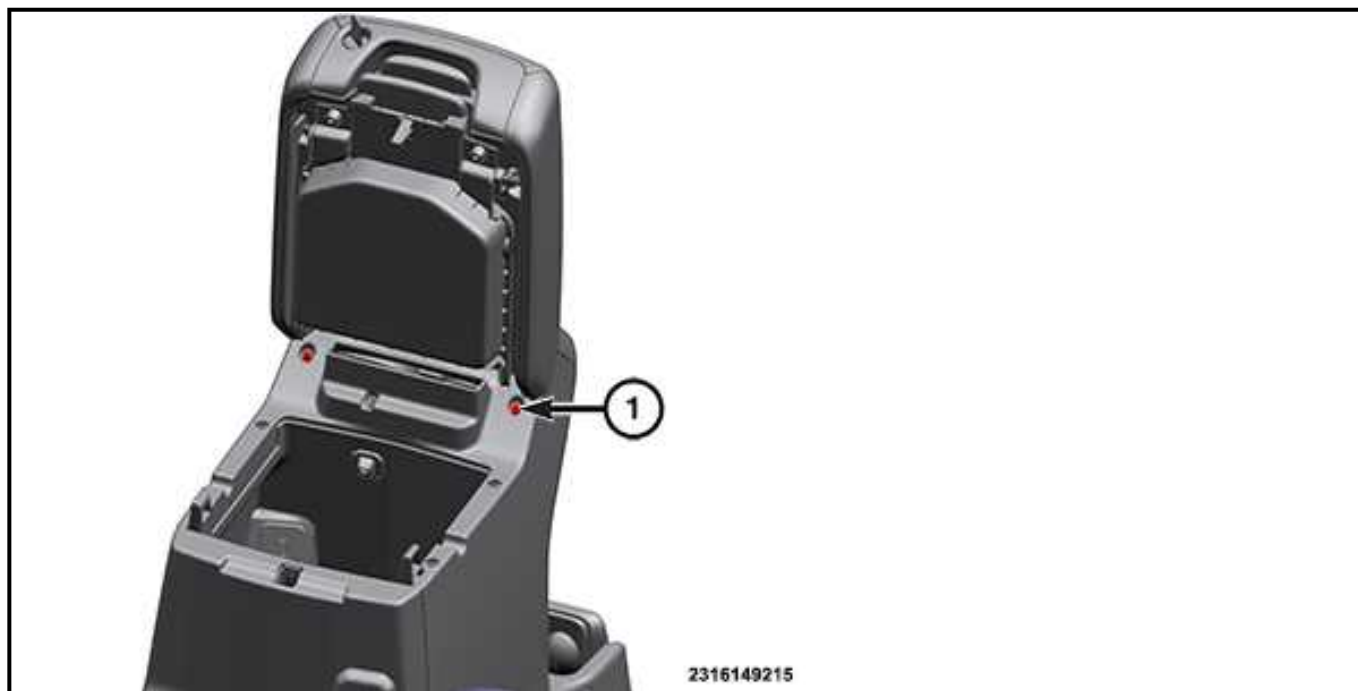
- Verify all clips are fully secured.
- All fasteners are tightened securely.

CONSOLE, FLOOR, END CAP

REMOVAL AND INSTALLATION

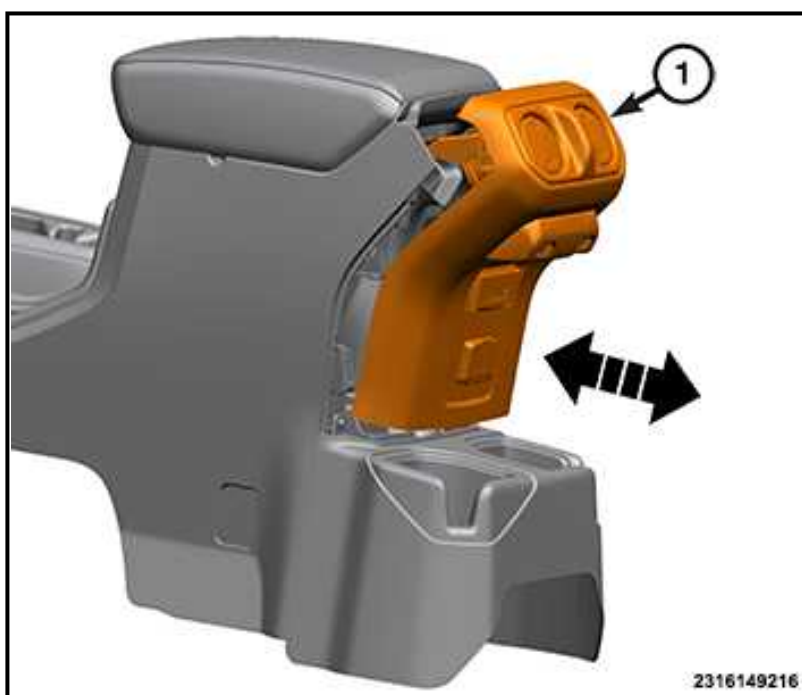
FLOOR CONSOLE END CAP

REMOVAL



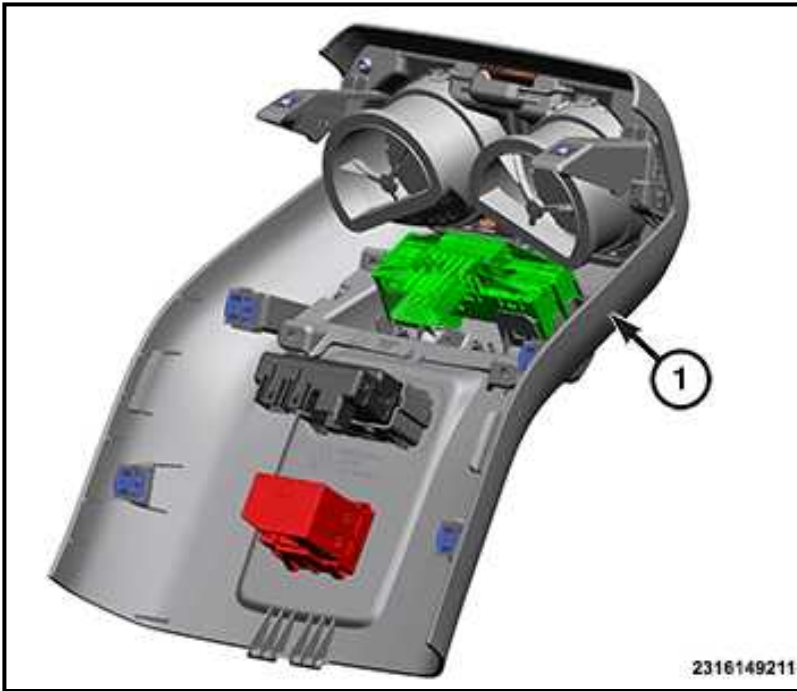
1 - Fasteners

1. Open armrest and console lid, and remove the fasteners.



1 - Console End Cap

2. Using a trim stick or equivalent, partially remove the floor console end cap.



1 - Console End Cap

3. Disconnect the wire harness connectors and remove floor console end cap from vehicle.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.
- All fasteners are tightened securely.

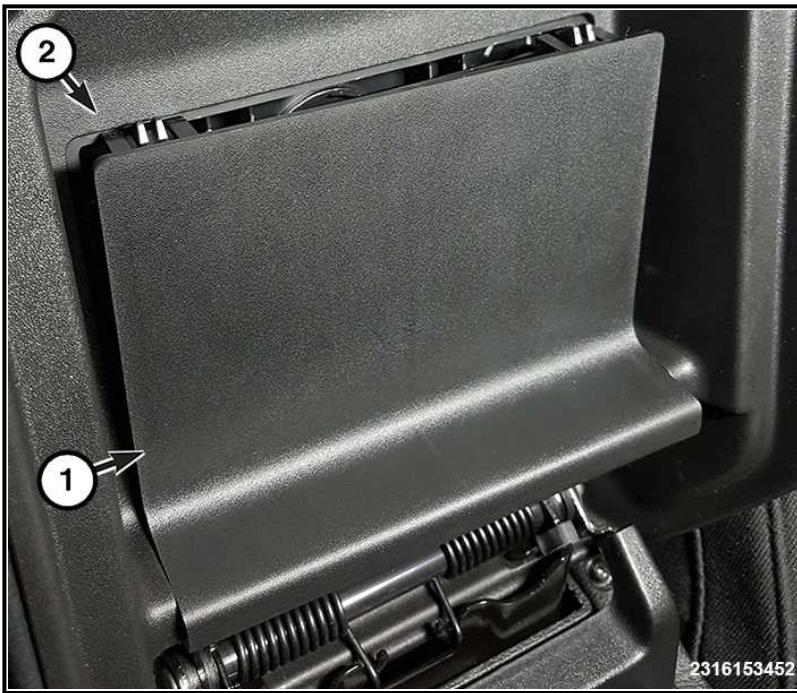
CYLINDER, ARMREST LOCK

REMOVAL AND INSTALLATION

ARMREST LOCK CYLINDER

REMOVAL

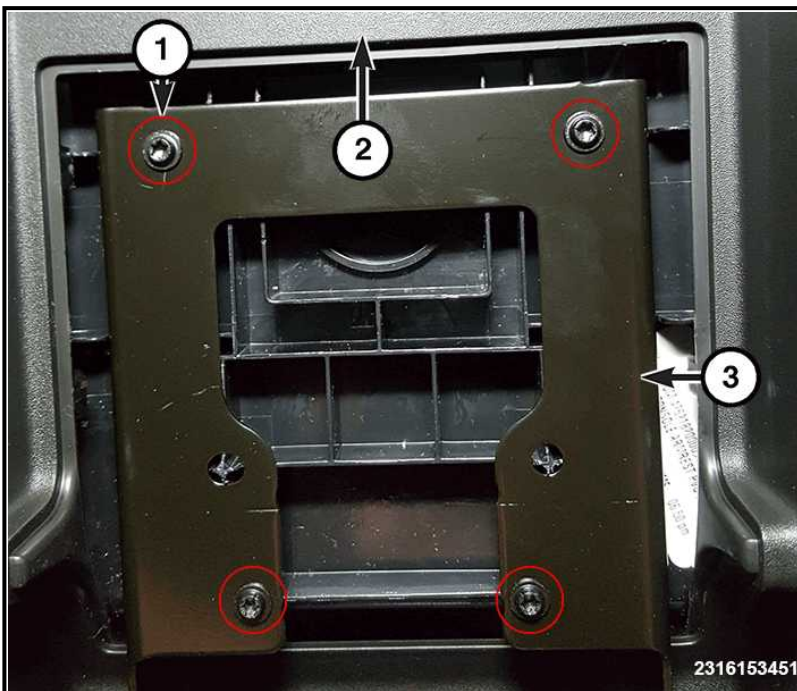
1. Open the armrest on the center console.



1 - Hinge Fastener Cover

2 - Armrest

2. Using a trim stick or equivalent, release the hinge fastener cover from the armrest and remove the cover.



1 - Screws

2 - Armrest

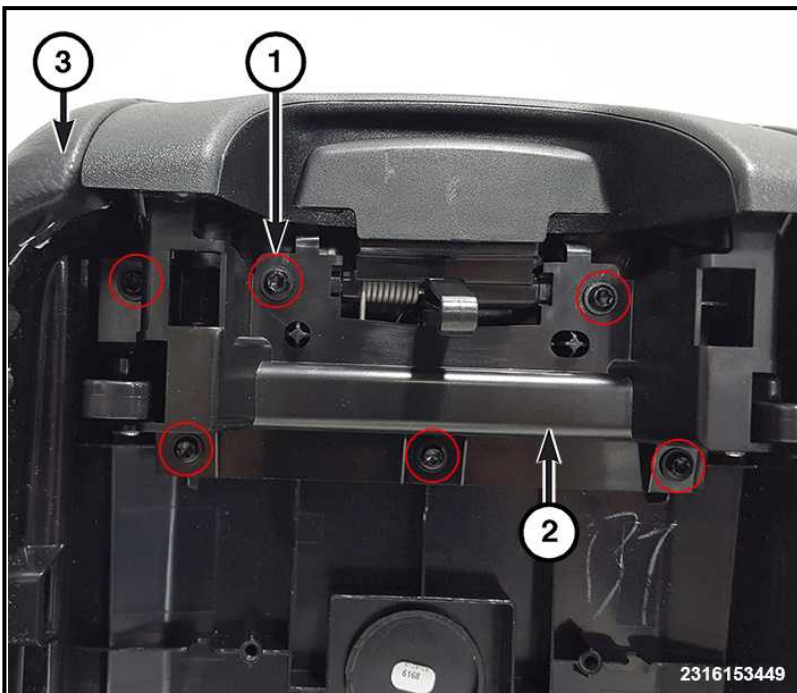
3 - Armrest Hinge

3. Remove the screws that secure the armrest to the armrest hinge and remove the armrest.



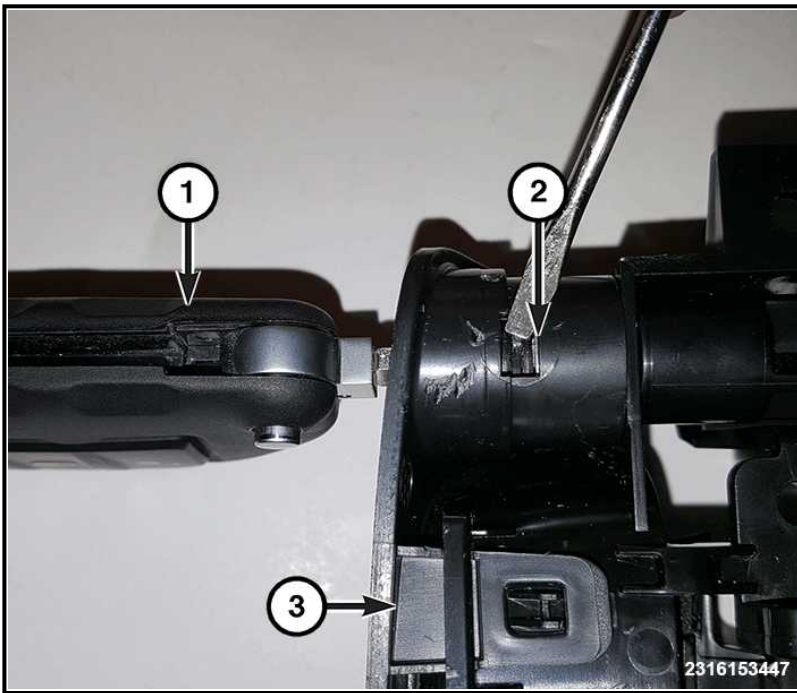
1 - Armrest Trim Panel
2 - Armrest

4. Using a trim stick or equivalent, remove the inner armrest trim panel from the armrest.



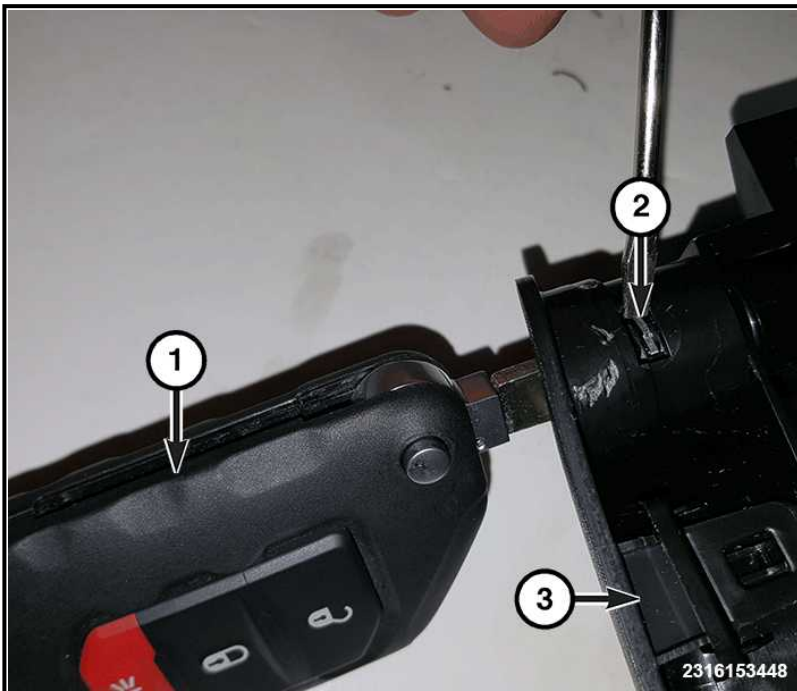
1 - Screws
2 - Armrest Latch Assembly
3 - Armrest

5. Remove the screws that secure the armrest latch assembly to the armrest and remove latch assembly.



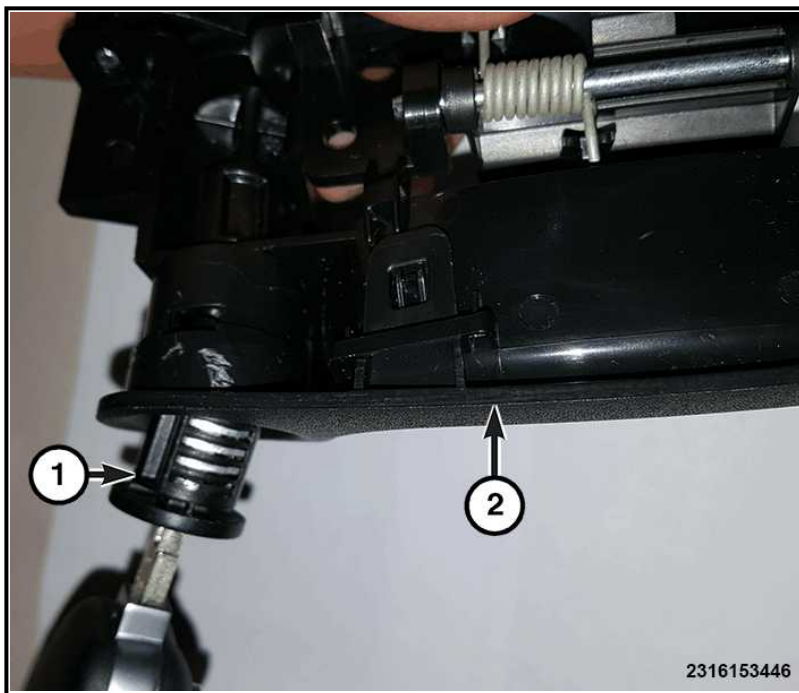
1 - Key
2 - Cylinder Release Lever
3 - Latch Assembly

6. Working from the top side of the latch assembly, insert the key into the armrest latch lock cylinder.
7. Using a small flat blade screwdriver, push down on the cylinder release lever.



1 - Key
2 - Cylinder Release Lever
3 - Latch Assembly

8. With release lever held down, rotate the key counter clockwise.



- | |
|--------------------|
| 1 - Lock Cylinder |
| 2 - Latch Assembly |

9. Remove the lock cylinder by pulling out on the key. The lock cylinder will come out from the latch assembly with the key.

INSTALLATION

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.
- All screws are tightened securely.

MIRROR, REARVIEW

REMOVAL AND INSTALLATION

REARVIEW MIRROR

REMOVAL

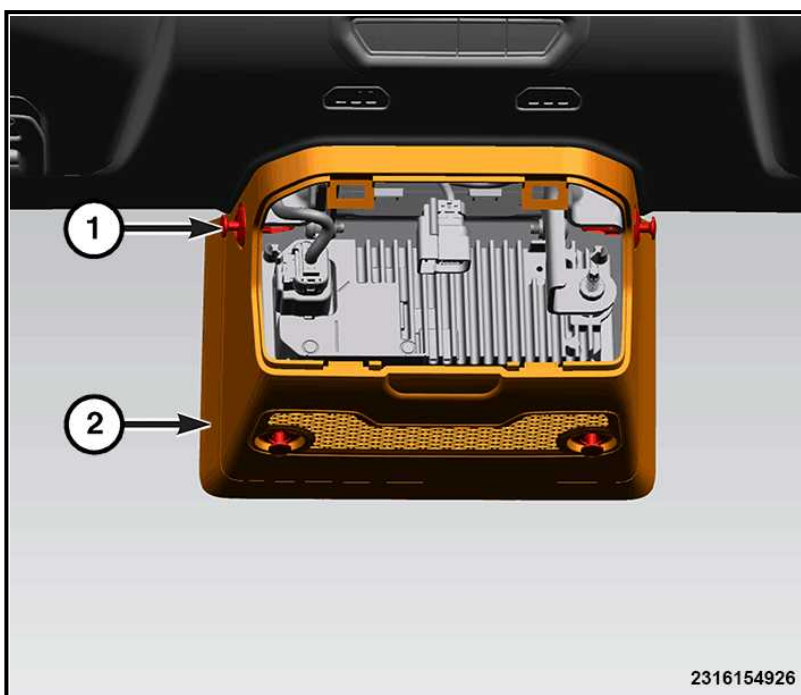
1. Remove the header panel. Refer to [PANEL, HEADER, REMOVAL AND INSTALLATION](#).

NOTE: If not equipped with the Drivers Assistance System Module (DASM) skip to step 4.



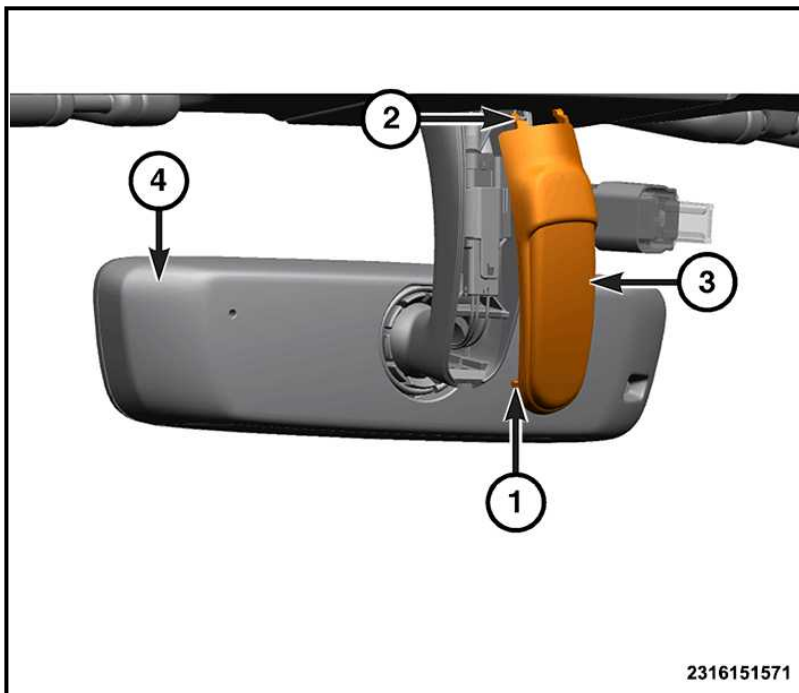
1 - Retaining Tabs
2 - DASM Rear Trim Cover

2. Using a trim stick or equivalent, release the retaining tabs and remove the DASM rear trim cover.



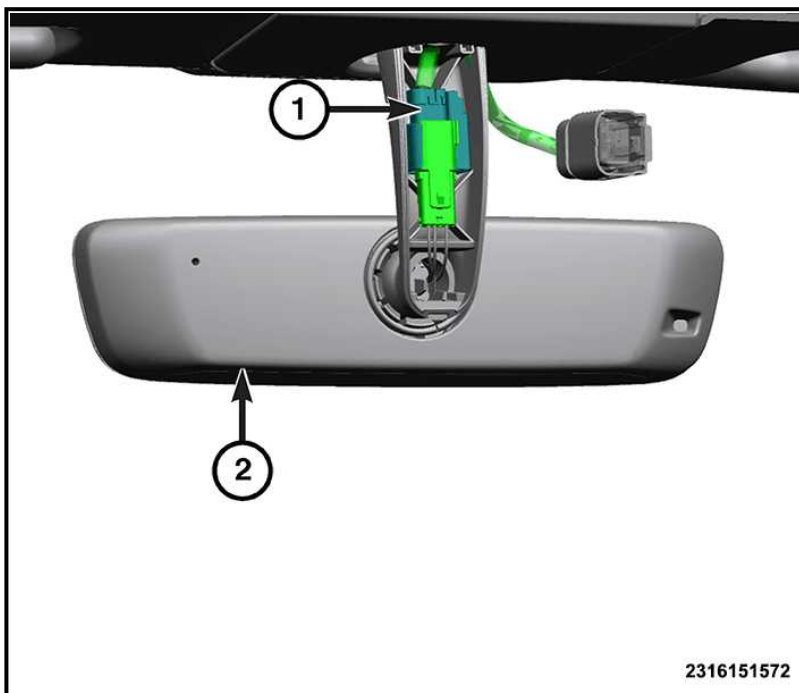
1 - Fasteners
2 - DASM Front Trim Cover

3. Remove the fasteners and remove the DASM front trim cover.



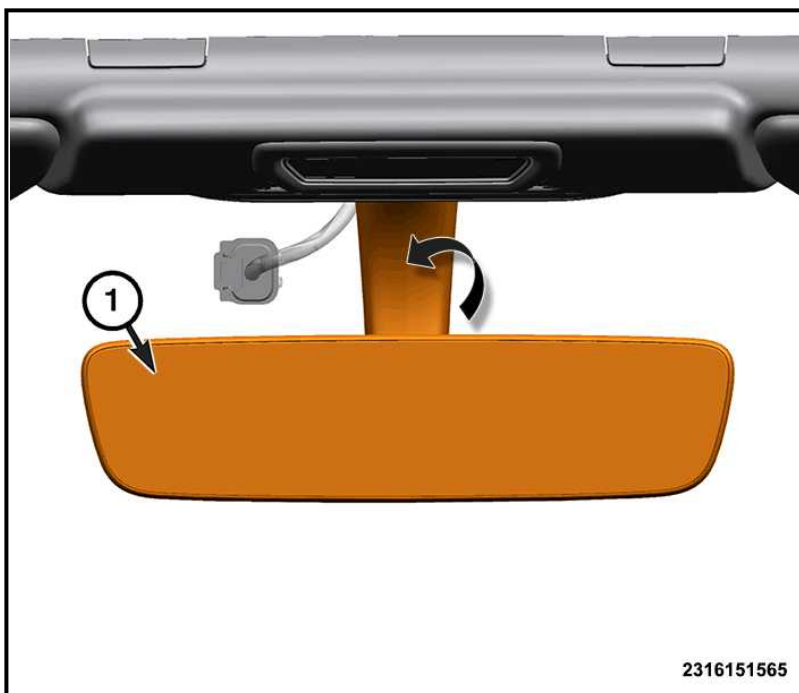
- | |
|---------------------------------|
| 1 - Lower Tab |
| 2 - Top Tabs |
| 3 - Rearview Mirror Cover Panel |
| 4 - Rearview Mirror |

4. Using a flat blade screwdriver or equivalent, release the lower tab on the rearview mirror cover panel and slide it down to disengage the top tabs to remove the cover panel from the rearview mirror.



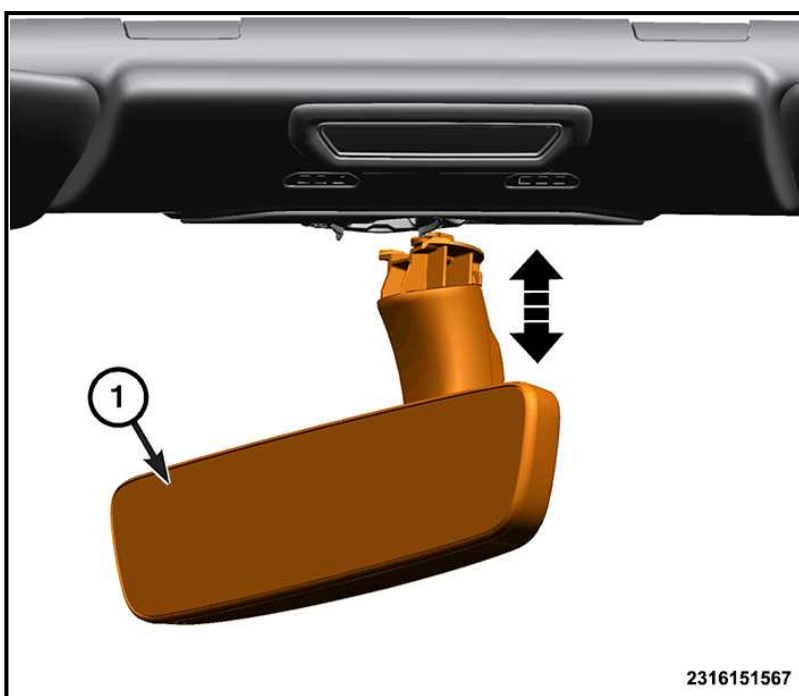
- | |
|----------------------------|
| 1 - Wire Harness Connector |
| 2 - Rearview Mirror |

5. Disconnect wire harness connector from the rearview mirror.



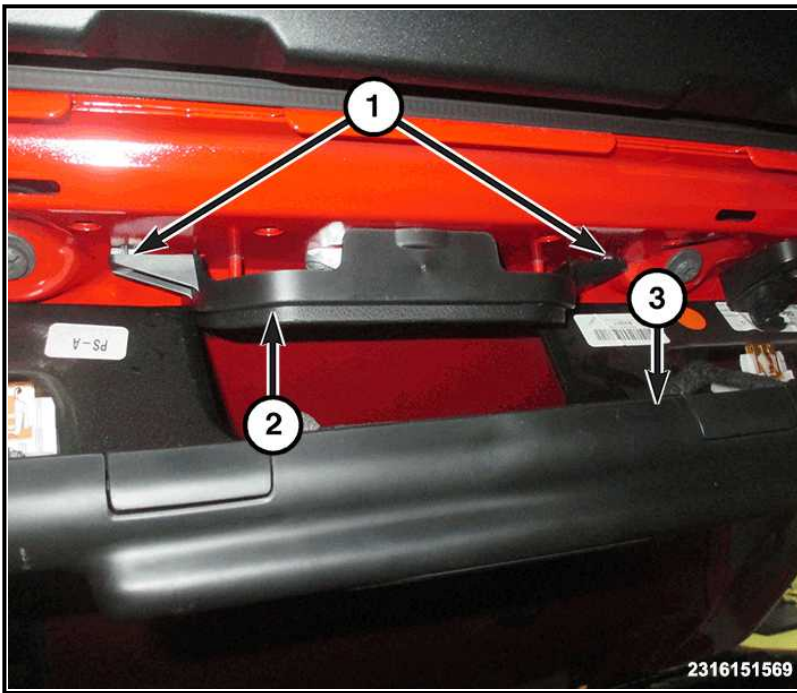
1 - Rearview Mirror

6. Holding the rearview mirror, turn it counter clockwise to release it from the base.



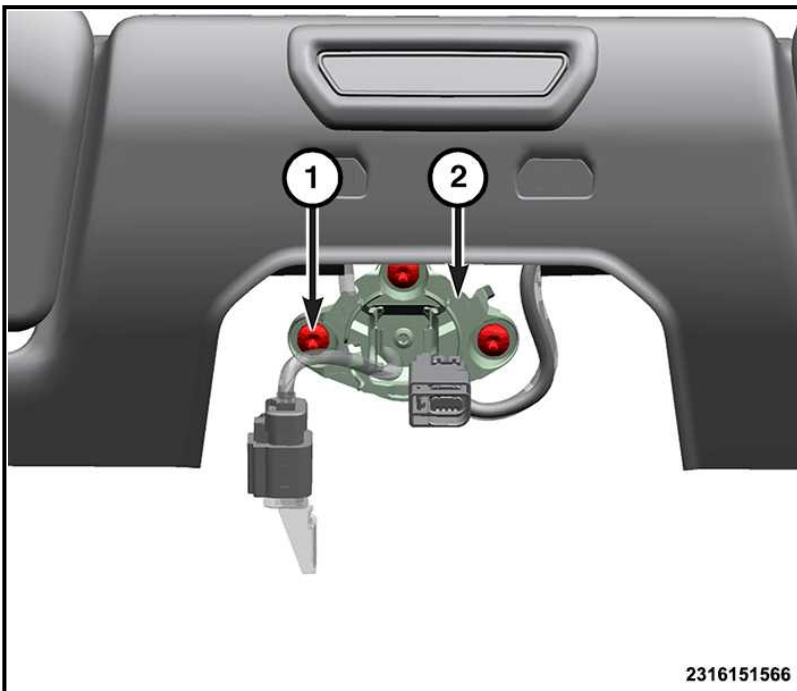
1 - Rearview Mirror

7. Lower the rearview mirror and remove it from the vehicle.



1 - Retaining Clips
2 - Rearview Mirror Base Cover
3 - Header Panel

8. With the header panel dropped out of the way release the retaining clips and remove the rearview mirror base cover.



1 - Screws
2 - Rearview Mirror Base

9. Remove the screws and the rear view mirror base from vehicle.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the rearview mirror base screws and tighten to the proper

Refer to **TORQUE SPECIFICATIONS** .

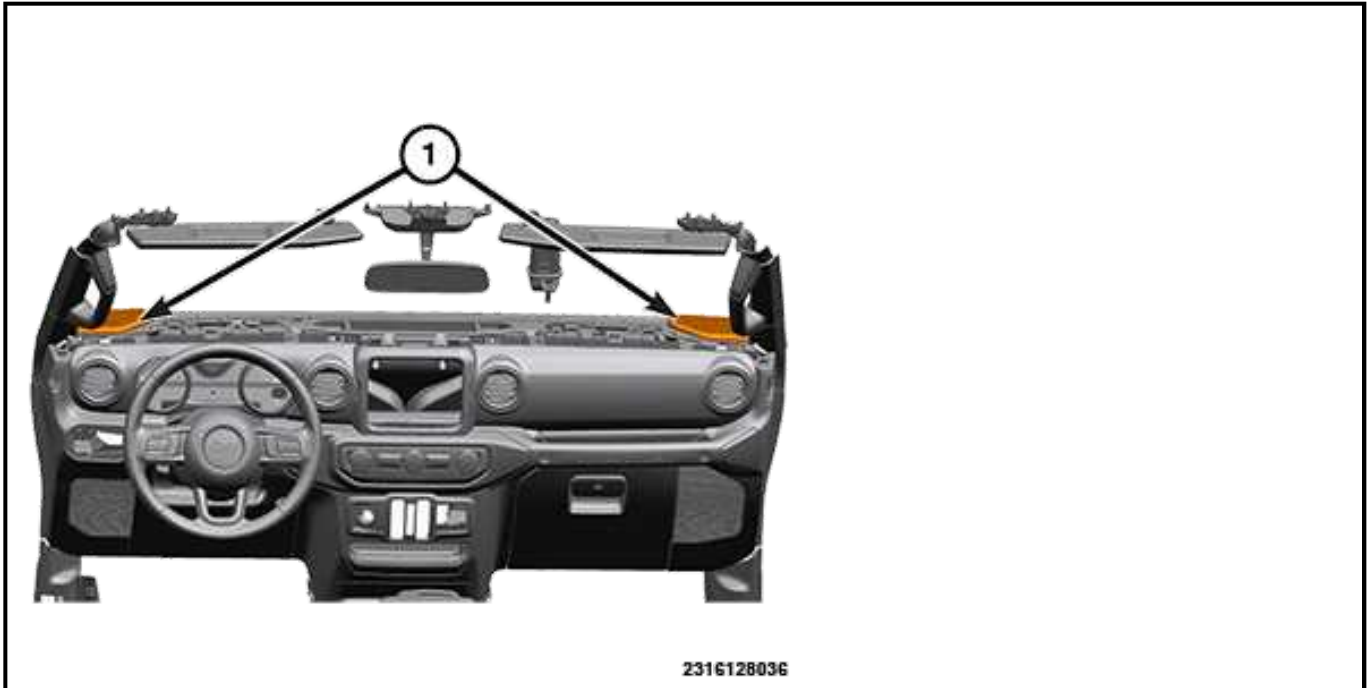
- Verify all clips are fully secured.

PANEL, A-PILLAR TRIM

REMOVAL AND INSTALLATION

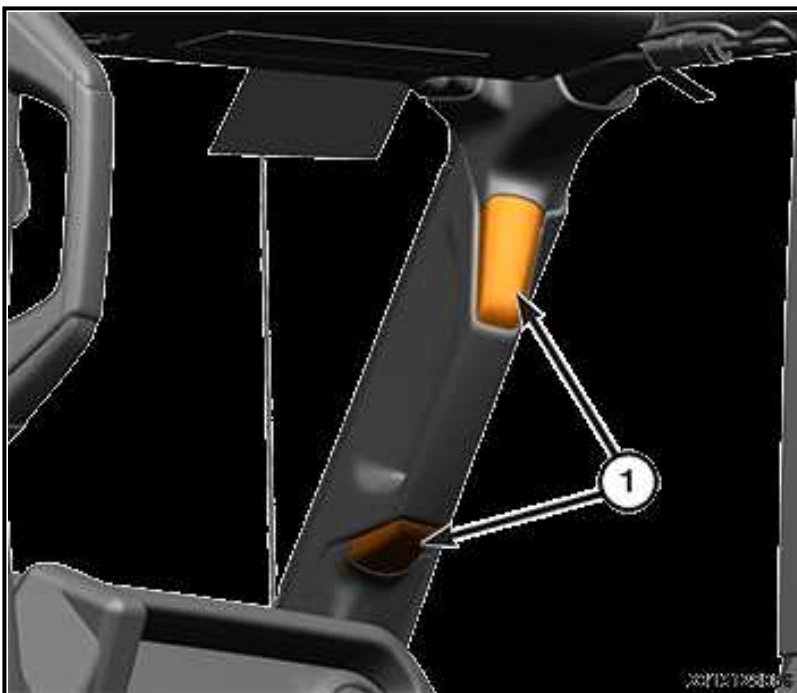
A-PILLAR TRIM PANEL

REMOVAL



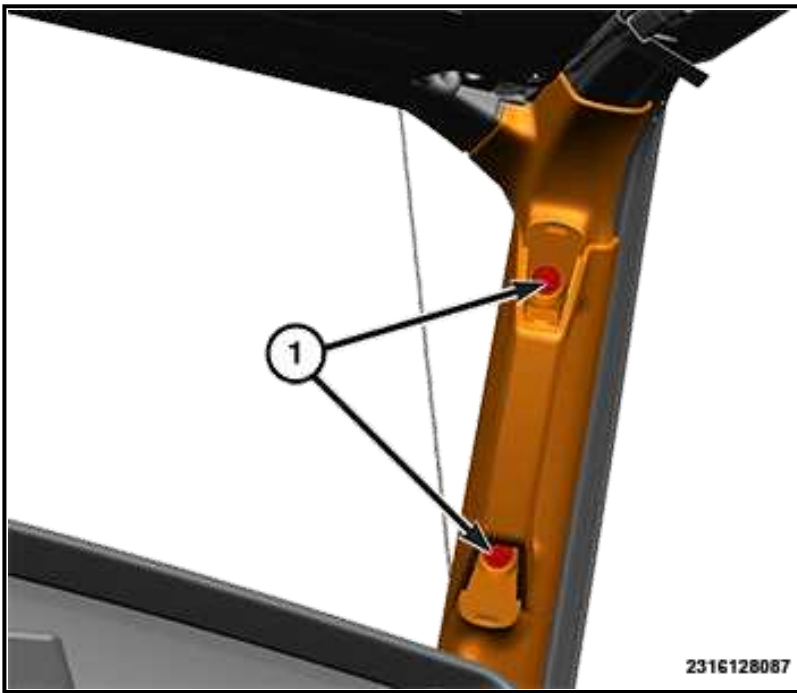
1 - Speaker Cover Grille

1. Remove the speaker cover grille.



1 - Bolt Covers

2. Using a trim stick or equivalent, carefully open the bolt covers.



1 - Bolts

3. Remove the bolts, then pull up and out on the A-pillar trim panel to release it from the instrument panel.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

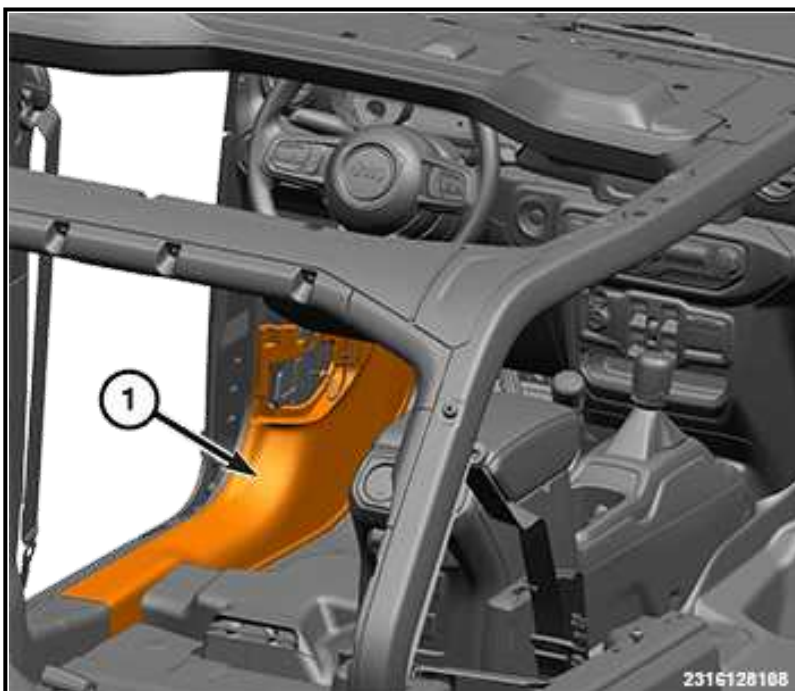
- Install the A-pillar trim panel bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

PANEL, B-PILLAR TRIM, LOWER

REMOVAL AND INSTALLATION

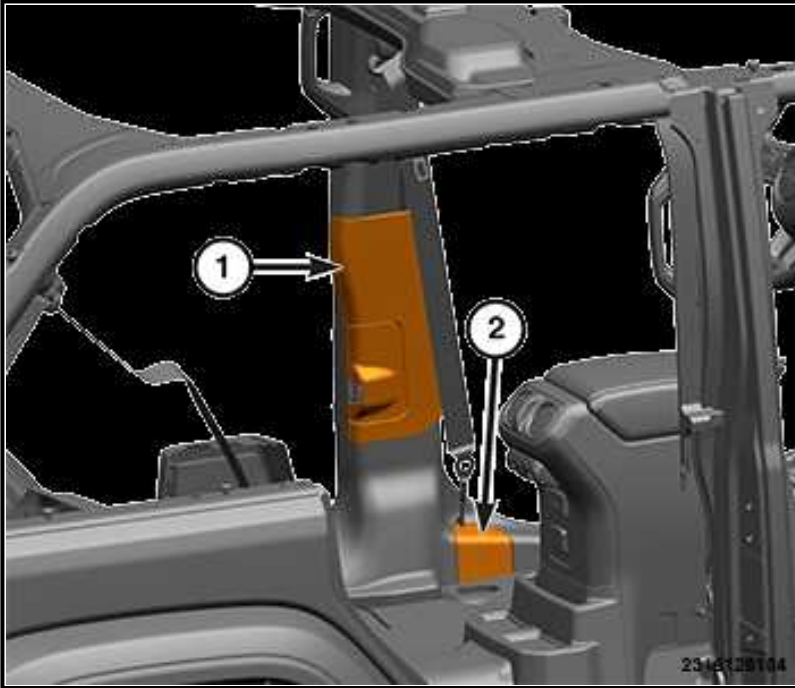
LOWER B-PILLAR TRIM PANEL

REMOVAL



1 - Cowl Trim Panel

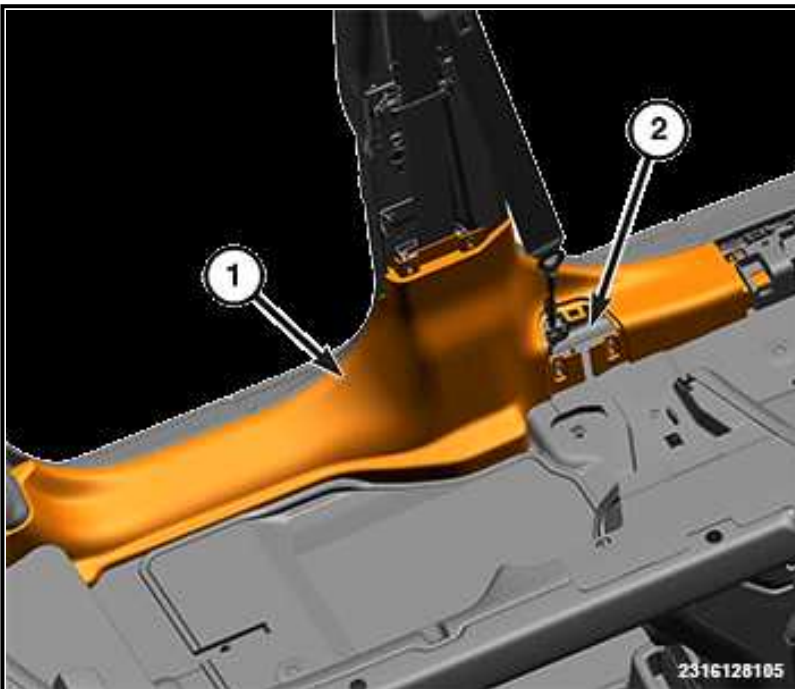
1. Using a trim stick or equivalent, loosen the rear of the cowl trim panel.



1 - B-pillar Extension Panel

2 - Seat Belt Access Cover

2. Using a trim stick or equivalent, remove the B-pillar extension panel and the seat belt access cover.



1 - Lower B-Pillar Trim Panel

2 - Split

3. Using a trim stick or equivalent, release the retaining clips and loosen the lower B-pillar trim panel.
4. Guide the seat belt through the split in the trim panel.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.

PANEL, B-PILLAR TRIM, UPPER

REMOVAL AND INSTALLATION

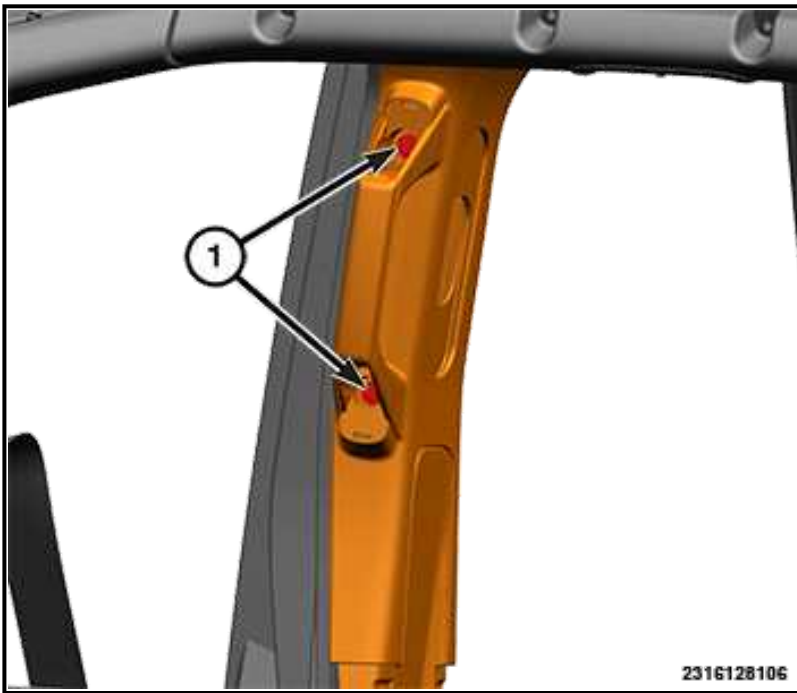
UPPER B-PILLAR TRIM PANEL

REMOVAL



1 - B-Pillar Extension

1. Move the front seat to the full forward position.
2. Spread the bottom of the B-pillar extension, then pull out to release the retaining clips and remove.
3. Remove the seat belt turning loop. Refer to [**ADJUSTER, SEAT BELT TURNING LOOP, REMOVAL AND INSTALLATION**](#) .



1 - Bolts

4. Using a trim stick or equivalent, remove the grab handle bolt covers then the bolts.
5. Pull at the bottom of the upper B-pillar trim panel to release the retaining clips and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

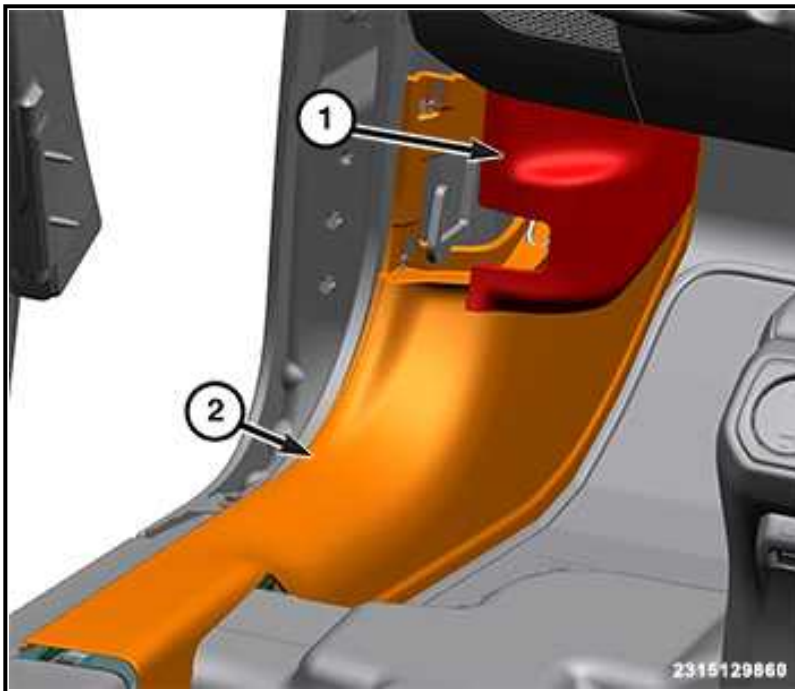
- Install the grab handle bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Verify all clips are fully secured.

PANEL, COWL TRIM

REMOVAL AND INSTALLATION

COWL TRIM PANEL

REMOVAL

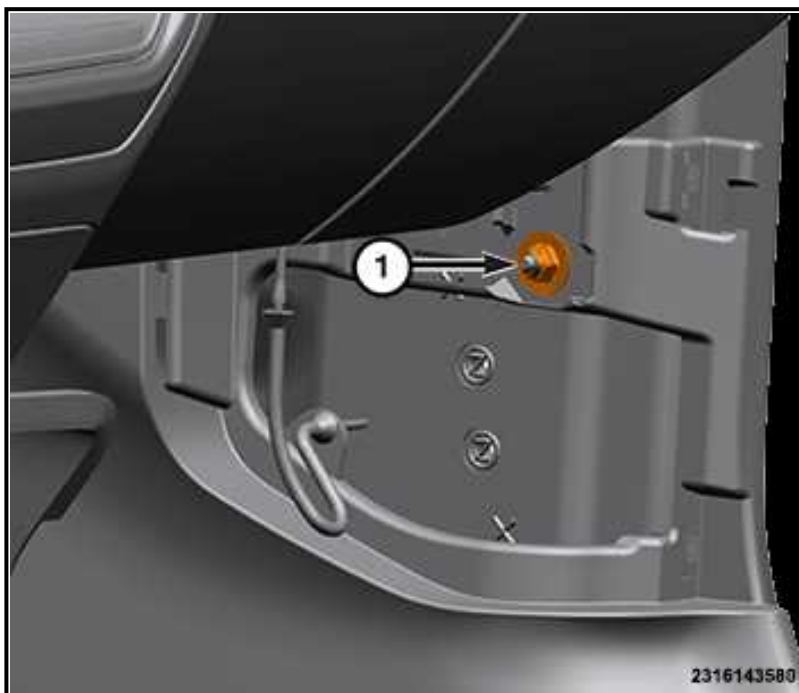


1 - Cover Panel

2 - Cowl Trim Panel

NOTE: Left side as shown in illustration, right side similar.

1. Using a trim stick or equivalent, release the cover panel from the cowl trim panel.



1 - Nut

NOTE: Right side as shown in illustration, left side similar.

2. Remove the nut that secures cowl panel to body.
3. Using a trim stick or equivalent, separate the front of the lower B-pillar trim panel from the cowl trim panel.
4. Disconnect the door check strap and the electrical connector.
5. Lift the cowl trim panel at the rear, then gently pull rearward and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.
- All fasteners are tightened securely.

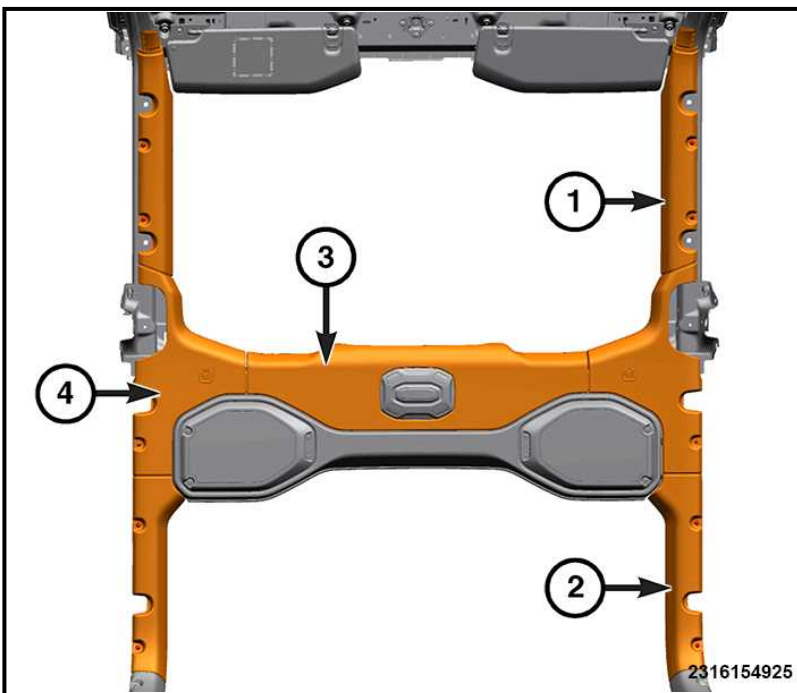
PANEL, D-PILLAR TRIM

REMOVAL AND INSTALLATION

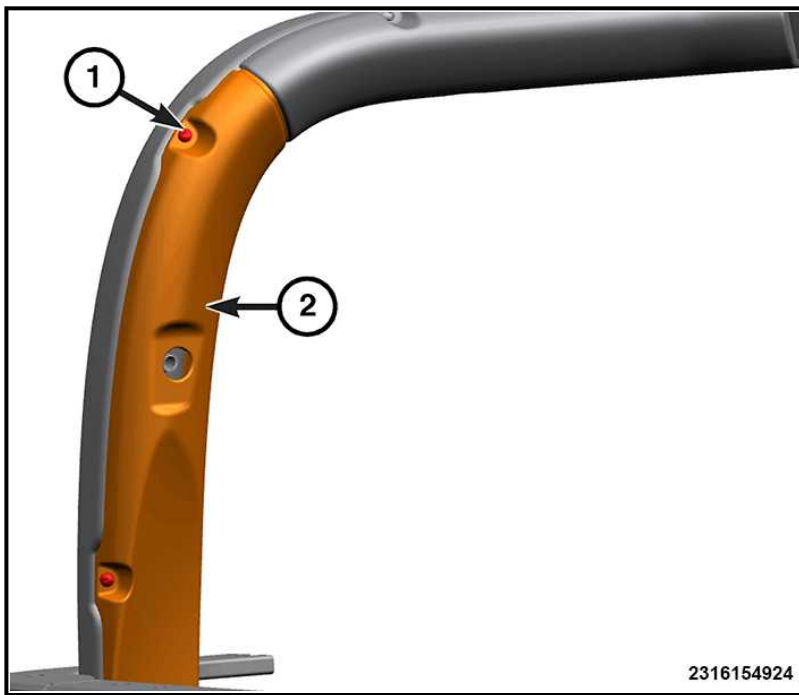
REMOVAL AND INSTALLATION

REMOVAL

1. Remove the rear seat belt retractor turning loop. Refer to [RETRACTOR, SEAT BELT, REMOVAL AND INSTALLATION](#) .



2. Remove the four screws from the rear door sport bar trim (2) and remove from vehicle.

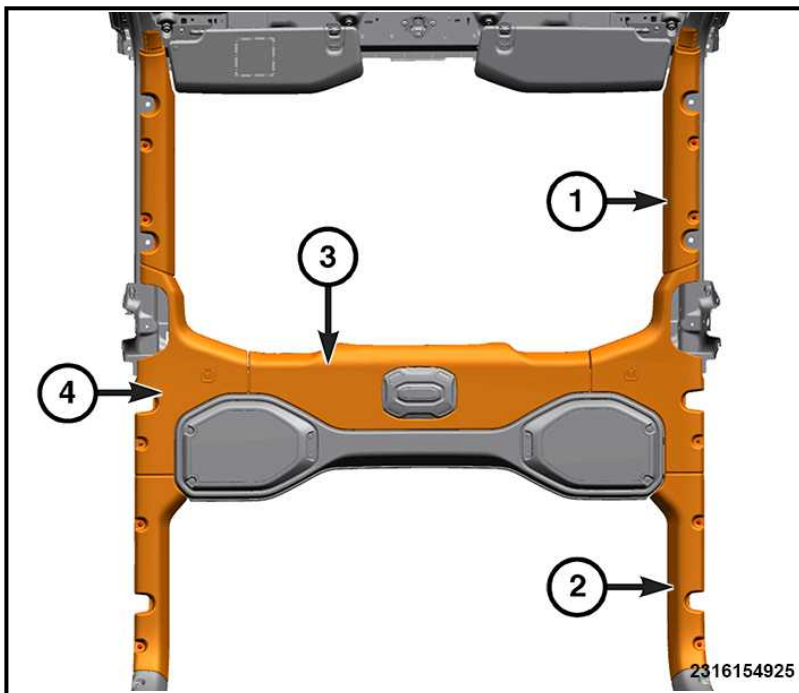


3. Remove the five screws (1) and remove the D-pillar trim (2).

INSTALLATION



1. Position the D-pillar trim (2) to the sport bar.
2. Install the five screws (1) that retain the trim panel and tighten them securely.



3. Position the rear door sport bar trim (2) to the sport bar.
4. Install the four screws that retain the trim and tighten them securely.
5. Install the rear seat belt retractor turning loop. Refer to [RETRACTOR, SEAT BELT, REMOVAL AND INSTALLATION](#).

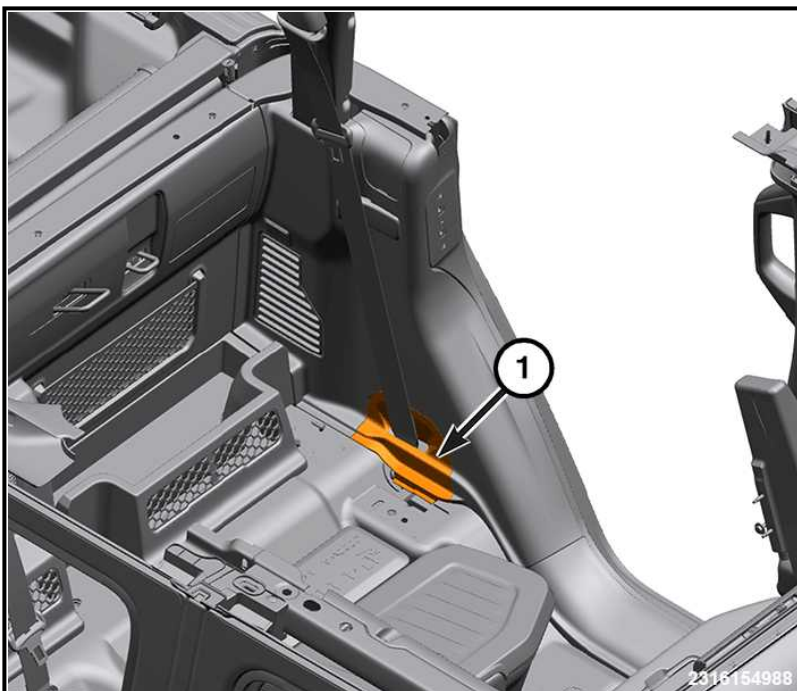
PANEL, QUARTER TRIM

REMOVAL AND INSTALLATION

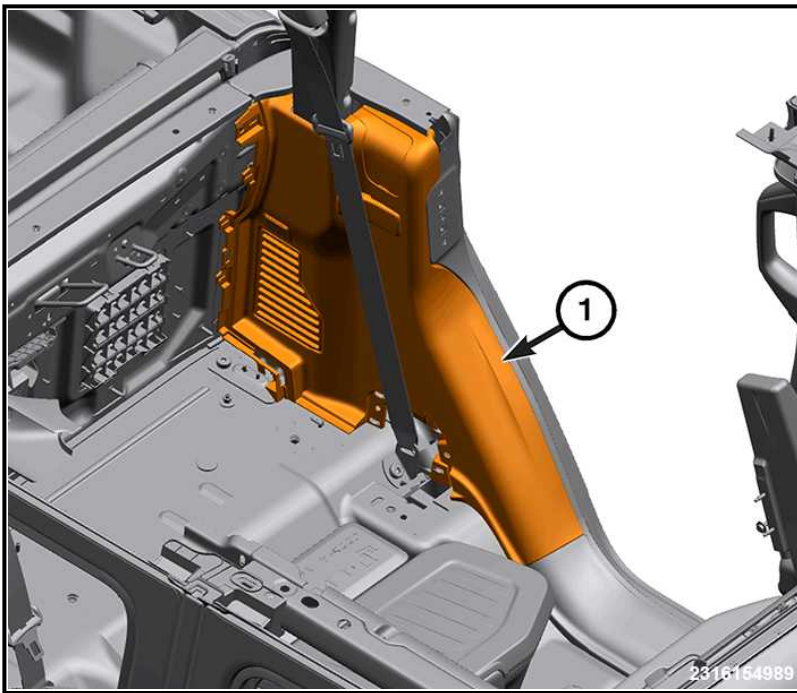
REMOVAL AND INSTALLATION

REMOVAL

1. Remove the rear cab panel trim. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#).



2. Using a trim stick or equivalent, remove the quarter panel trim lower seat belt closeout (1).



3. Using a trim stick or equivalent, disengage the retainer clips and lift in and up to remove the quarter panel trim (1) from vehicle.
4. If necessary, disconnect the wire harness connectors.

INSTALLATION

1. If necessary, connect the wire harness connectors.
2. Position the quarter panel trim into place and press in to engage retaining clips to install the trim panel.
3. Install the seat belt closeout to the quarter trim panel trim.
4. Install the rear cab panel trim. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#).

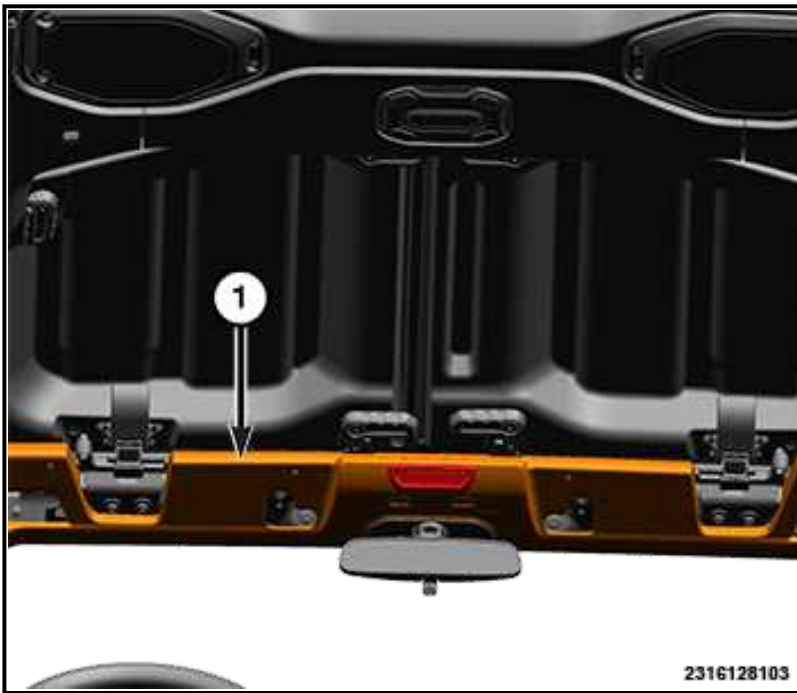
PANEL, HEADER

REMOVAL AND INSTALLATION

FRONT HEADER PANEL

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove both of the A-pillar trim panels. Refer to [PANEL, A-PILLAR TRIM, REMOVAL AND INSTALLATION](#).
3. Remove both of the visors. Refer to [VISOR, REMOVAL AND INSTALLATION](#).
4. Remove both of the visor supports. Refer to [SUPPORT, VISOR, REMOVAL AND INSTALLATION](#).



1 - Header Panel

5. Using a trim stick or equivalent tool, disengage the retaining clips lowering the header panel slightly.
6. Disconnect the wire harness connectors and remove the header panel.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

PANEL, CAB BACK TRIM

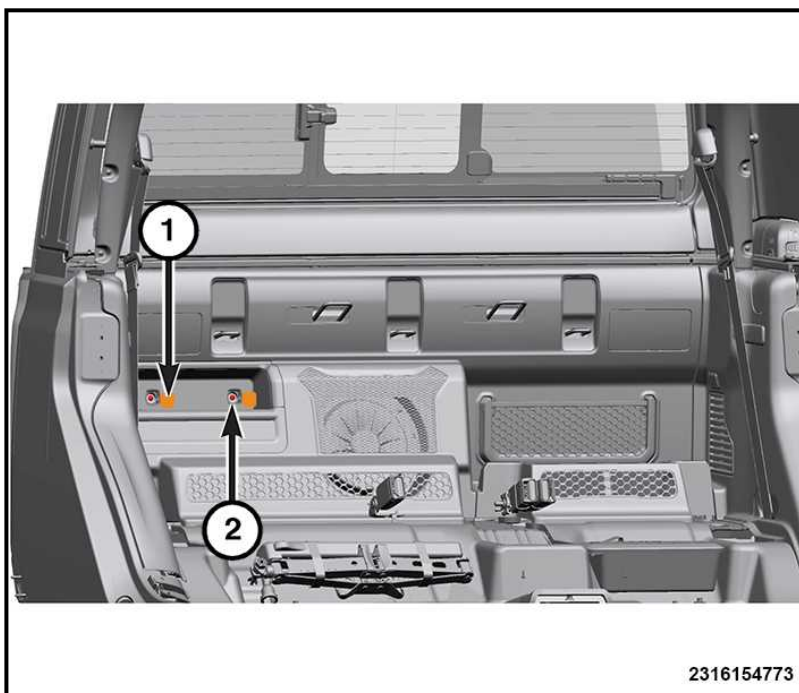
REMOVAL AND INSTALLATION

WITH SUBWOOFER

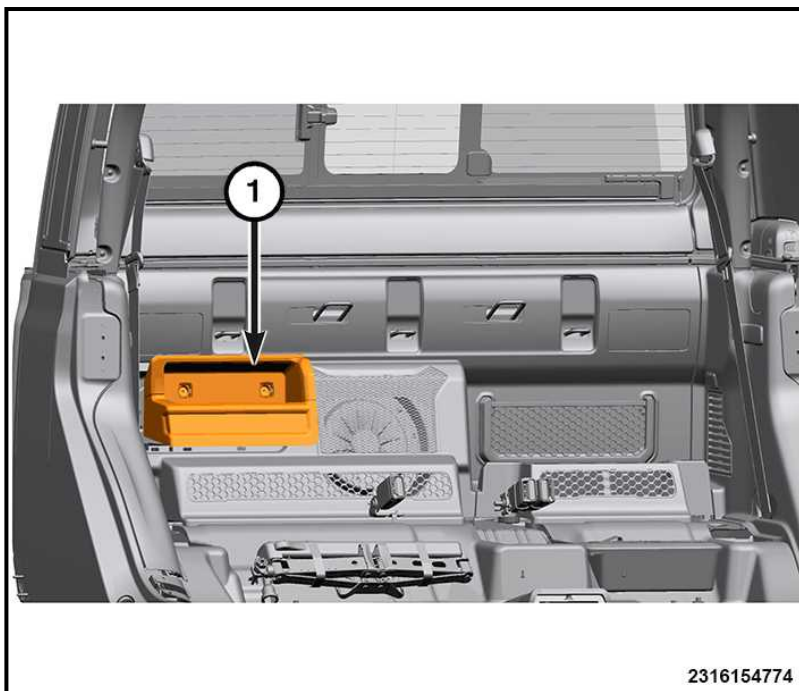
REMOVAL

1. Remove the rear seats. Refer to [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

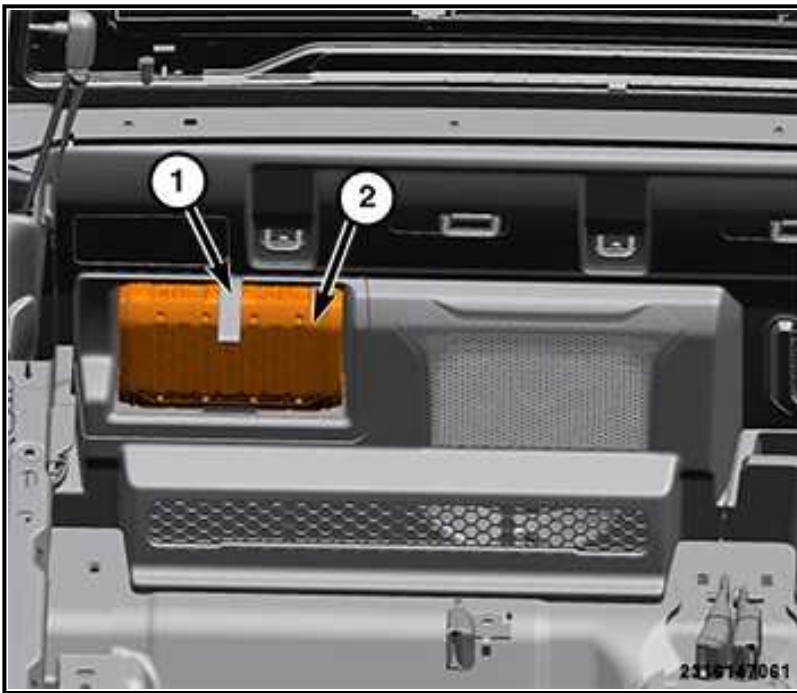
NOTE: If equipped with the bluetooth wireless speaker skip to step 4.



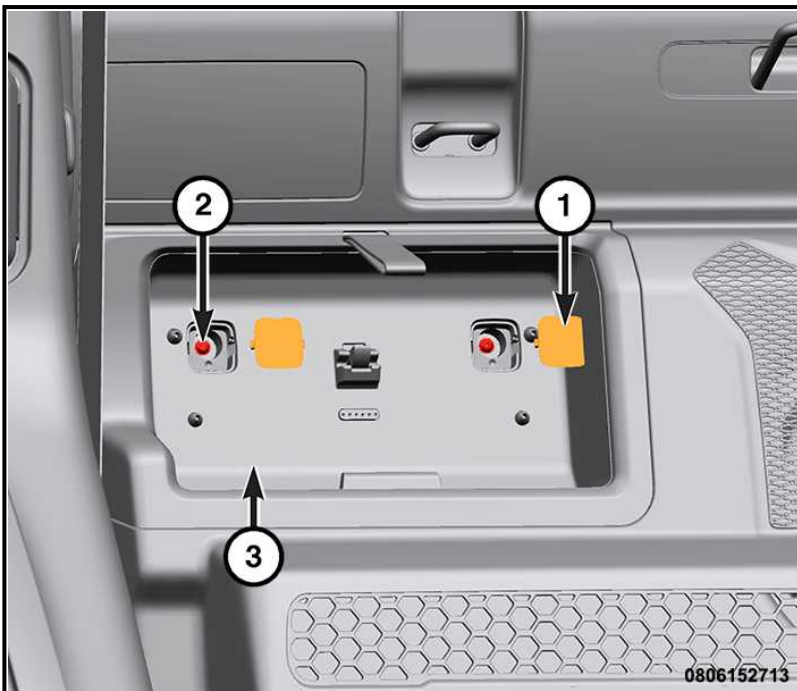
2. Using a small flat blade screwdriver, remove the two screw covers (1), then remove the two screws (2) from the rear cab trim upper storage bin.



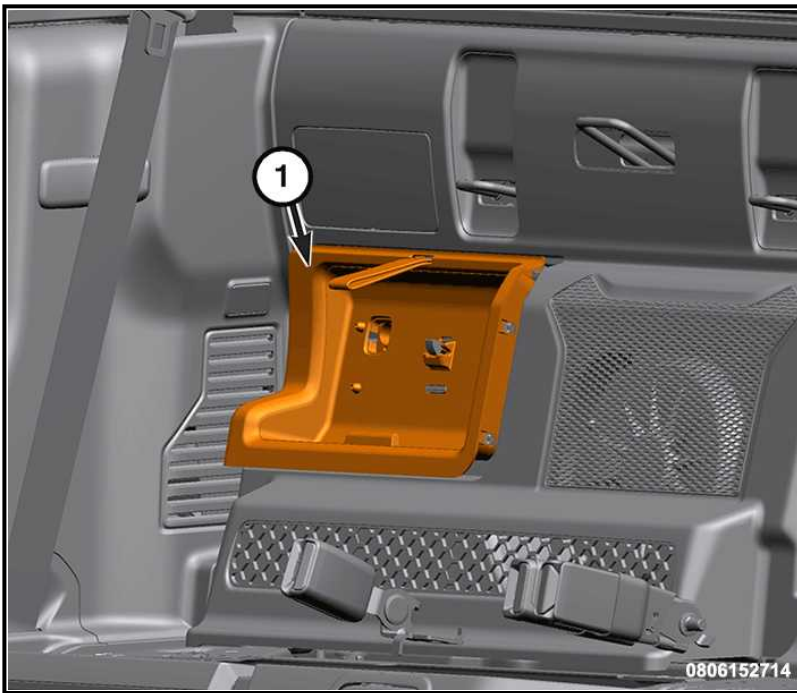
3. Using a trim stick or equivalent, release the rear cab trim upper storage bin (1) from the rear cab trim panel.



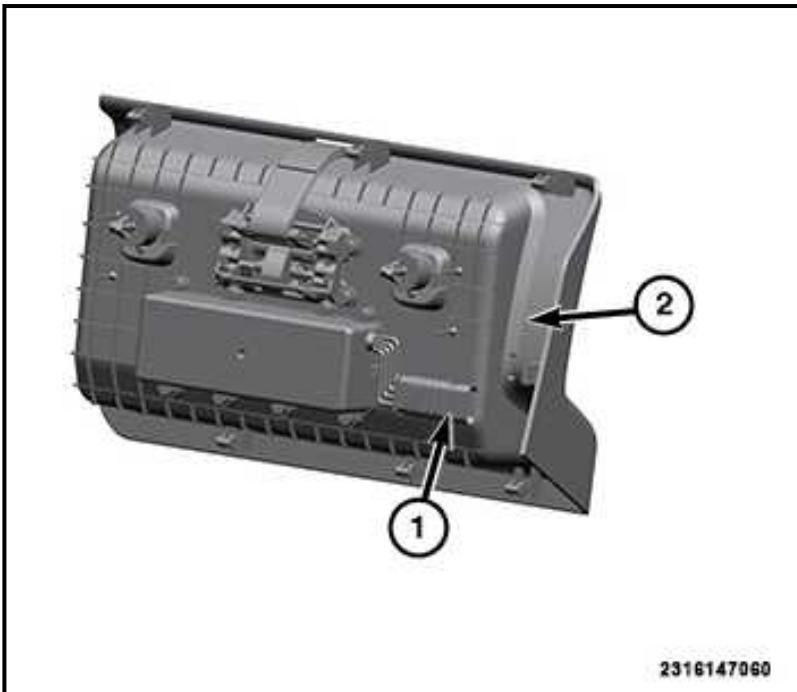
4. If equipped with the bluetooth wireless speaker, release the wireless speaker (2) from carrier by pulling release handle (1) and remove.



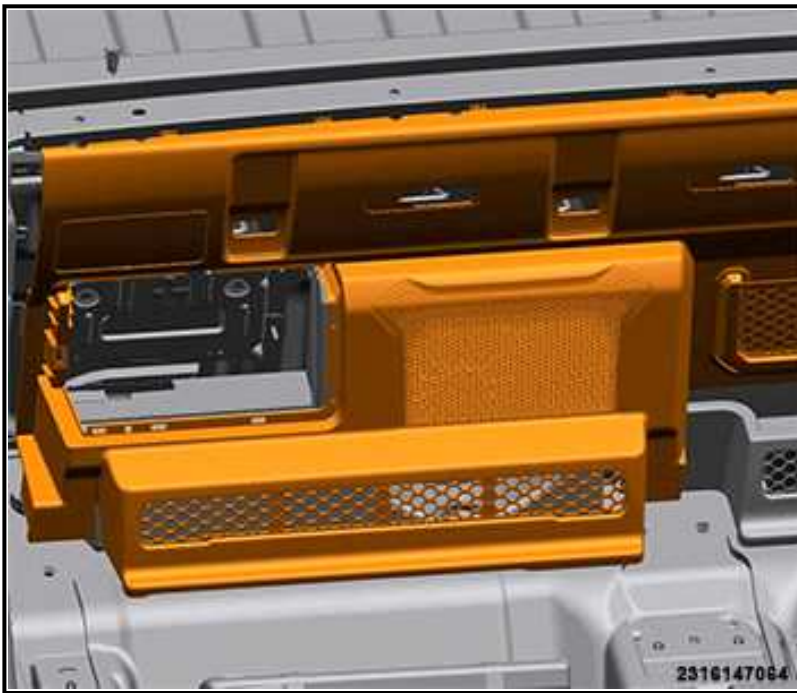
5. Using a small flat blade screwdriver, remove the two screw covers (1), then remove the two screws (2) from the wireless speaker carrier (3).



6. Using a trim stick or equivalent, release the wireless speaker carrier (1) from the rear cab trim panel.

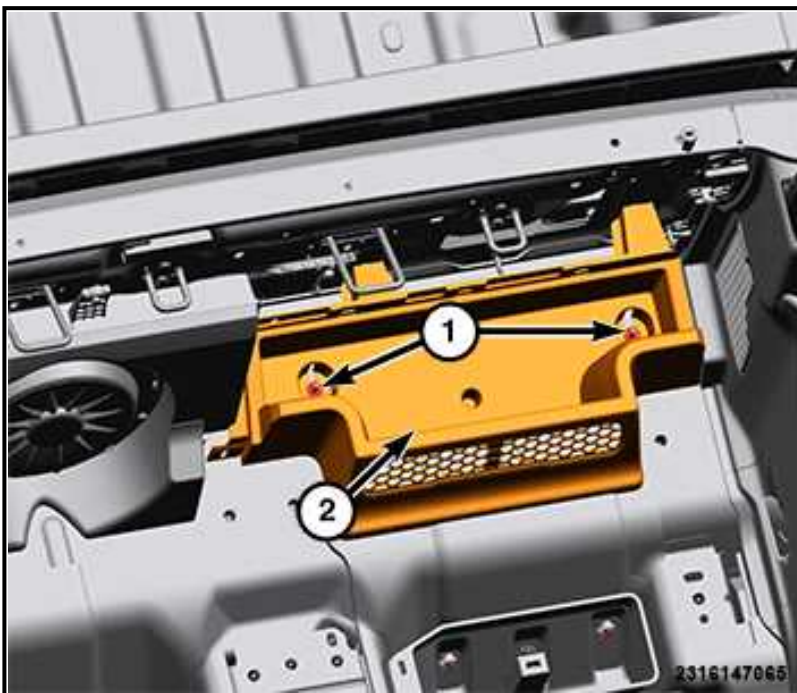


7. Disconnect the wire harness connector (1) and remove the wireless speaker carrier (2).



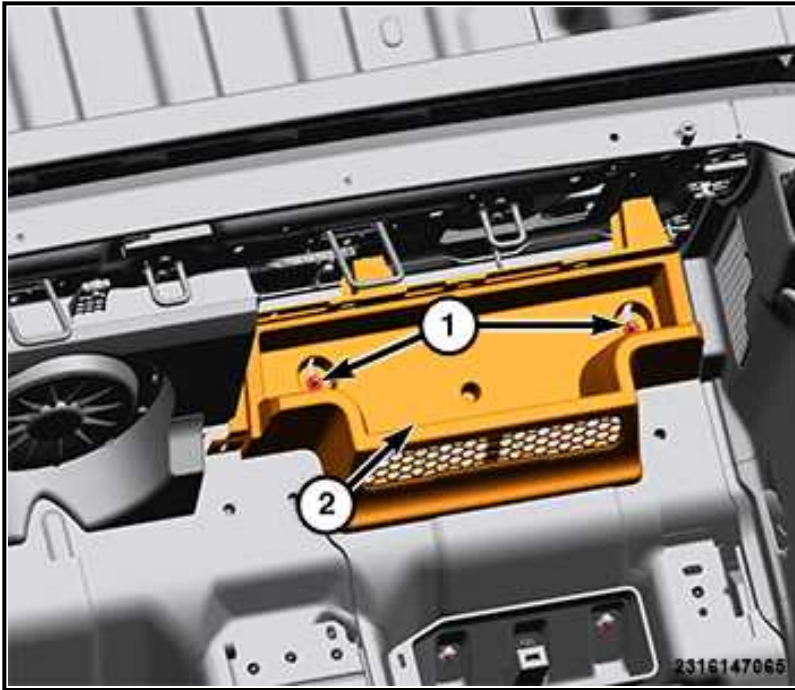
NOTE: The retaining clips across the top of the rear cab trim panel are metal and may require more force.

8. Using a trim stick or equivalent release the retaining clips around the edges of the rear cab trim panel and remove it from rear cab.

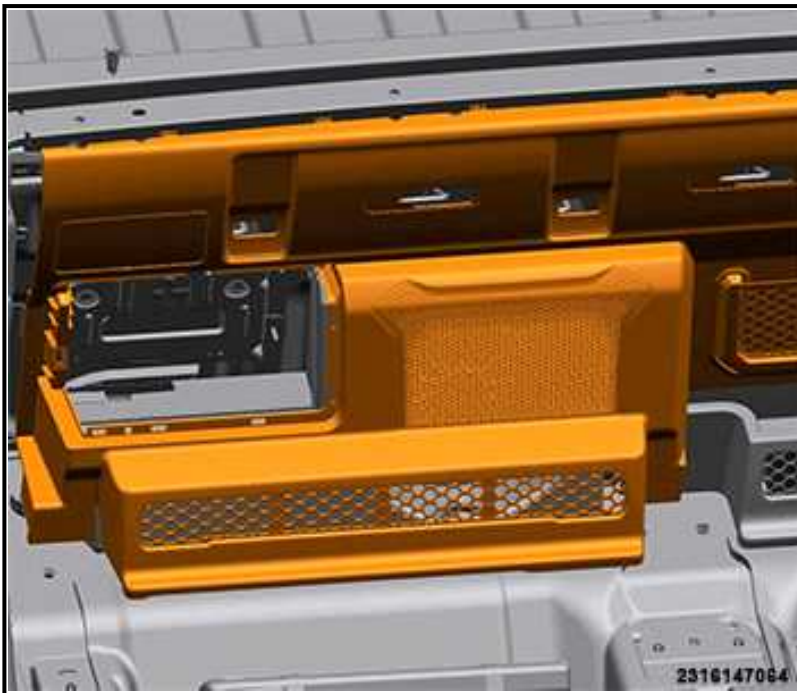


9. To remove the rear cab trim panel lower storage bin (2), remove the storage bin liner. Remove the two fasteners (1), then using a trim stick or equivalent release the retaining clips from the rear of the bin and remove storage bin from rear cab panel.

INSTALLATION

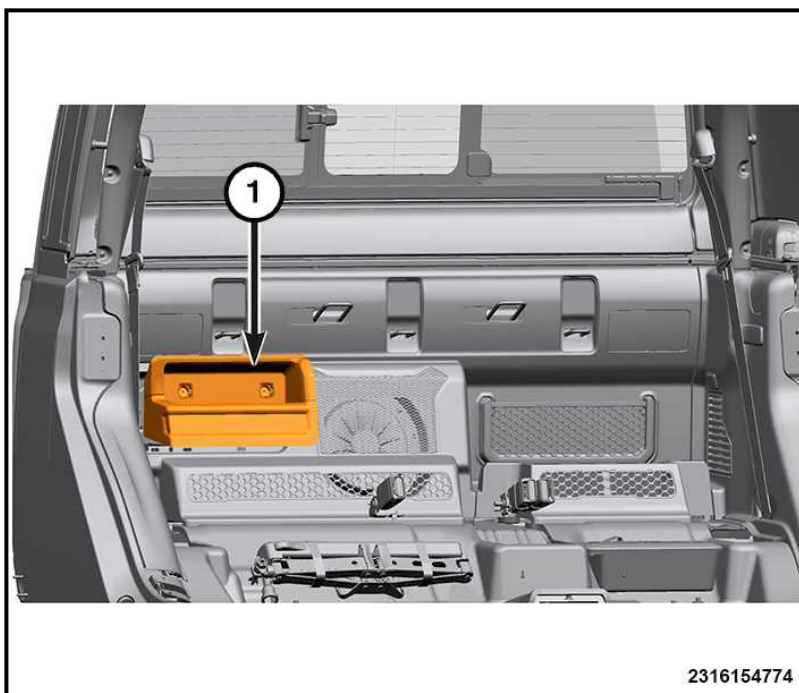


1. Position the rear cab panel lower storage bin (2) into place and engaging retainer clips to the rear cab panel. Install the two fasteners (1), tighten securely and install storage bin liner.

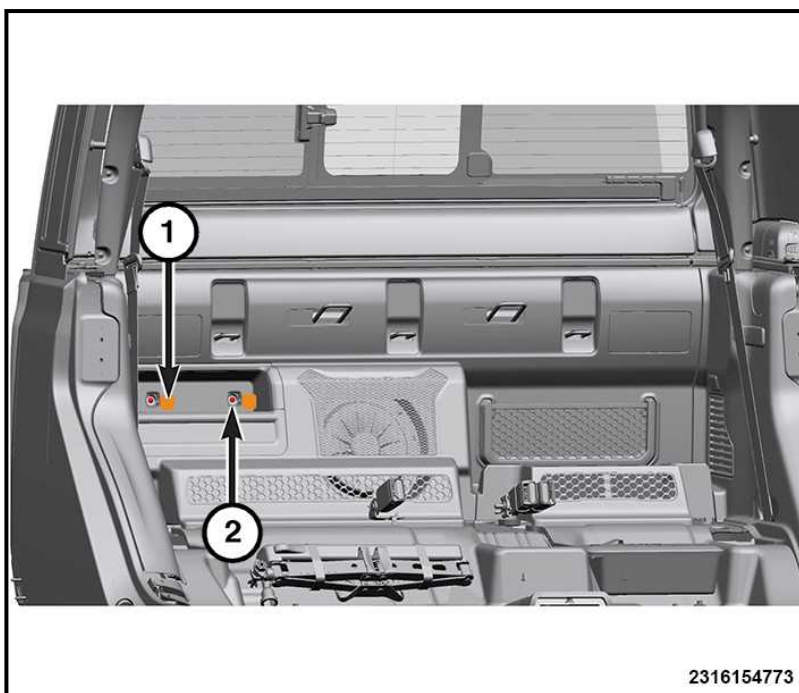


2. Position rear cab trim panel to the rear cab panel, insert the retaining clips and press trim panel until all retaining clips are fully engaged into the rear cab panel.

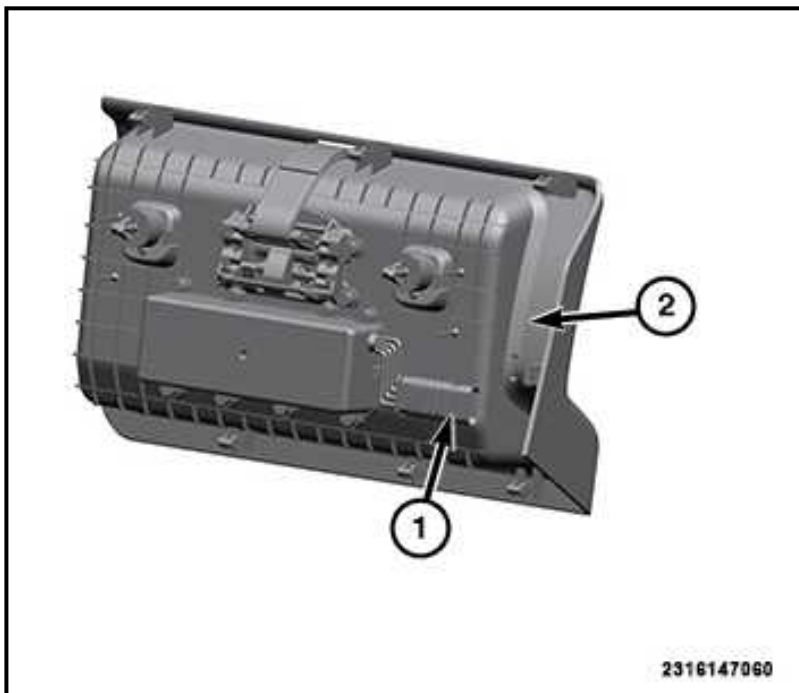
NOTE: If equipped with bluetooth wireless speaker skip to step 5.



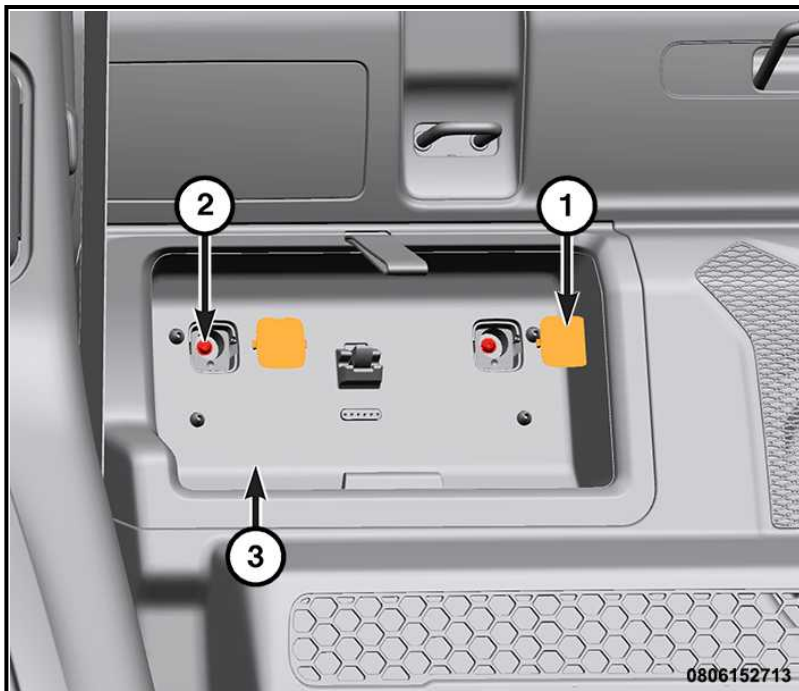
3. Insert the rear cab trim panel upper storage bin (1) to the rear cab trim panel making sure the retaining clips are fully seated into the rear cab trim panel.



4. Install the two screws (2) and tighten securely. Install the two screw covers (1).



5. If equipped with bluetooth wireless speaker, connect wire harness connector (1) and insert the wireless speaker carrier (2) into the rear cab panel trim by pressing carrier to engage retainer clips.

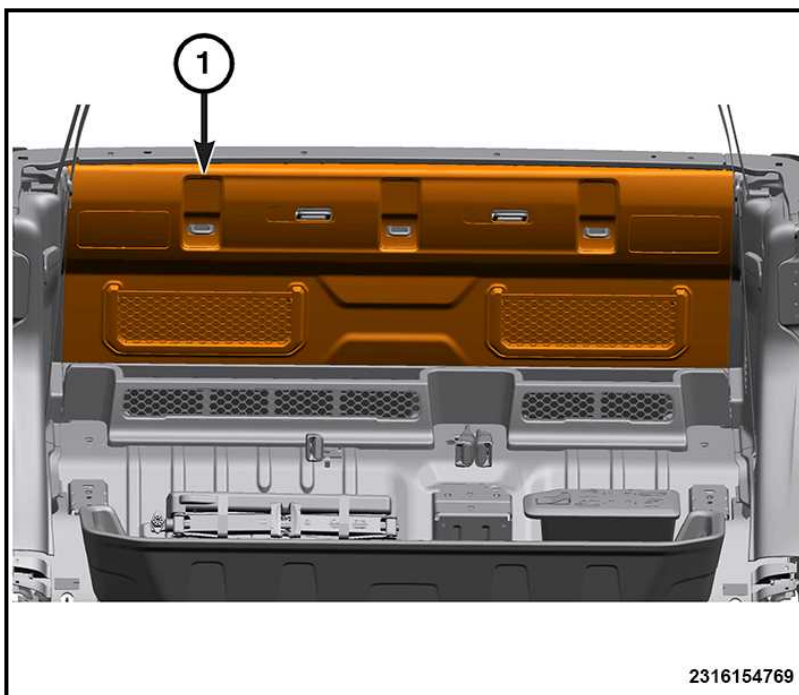


6. Install the two screws (2) and tighten securely. Install the two screw covers (1).
7. Install wireless speaker into carrier (3).
8. Install the rear seats. Refer to [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

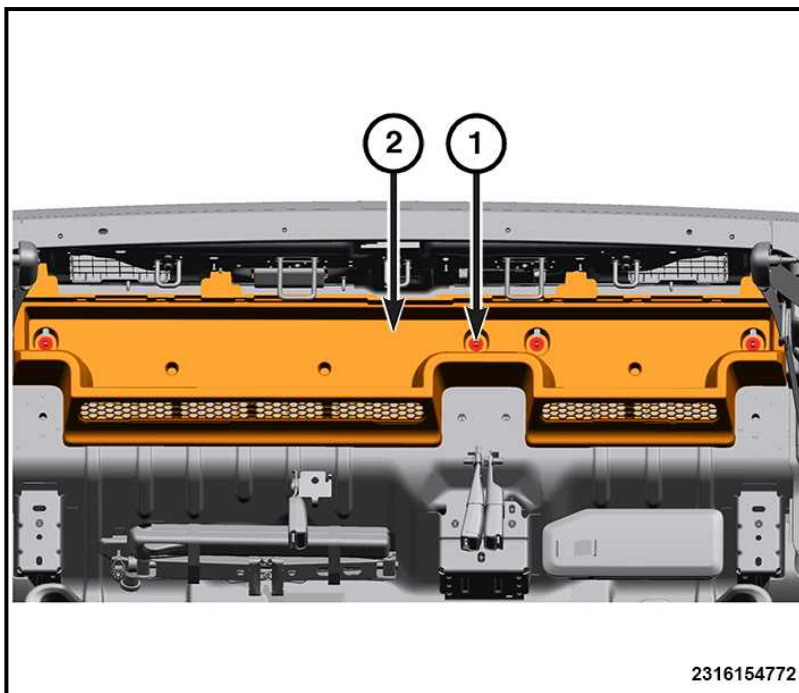
WITHOUT SUBWOOFER

REMOVAL

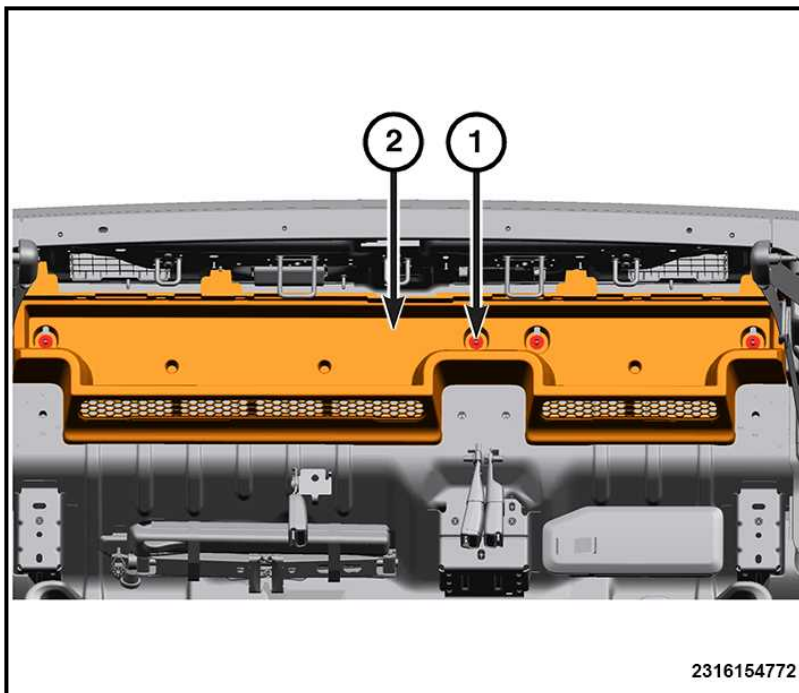
1. Remove the rear seats. Refer to [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).



2. Using a trim stick or equivalent, release the retaining clips around the edges of the rear cab trim panel (1) and remove it from rear cab.

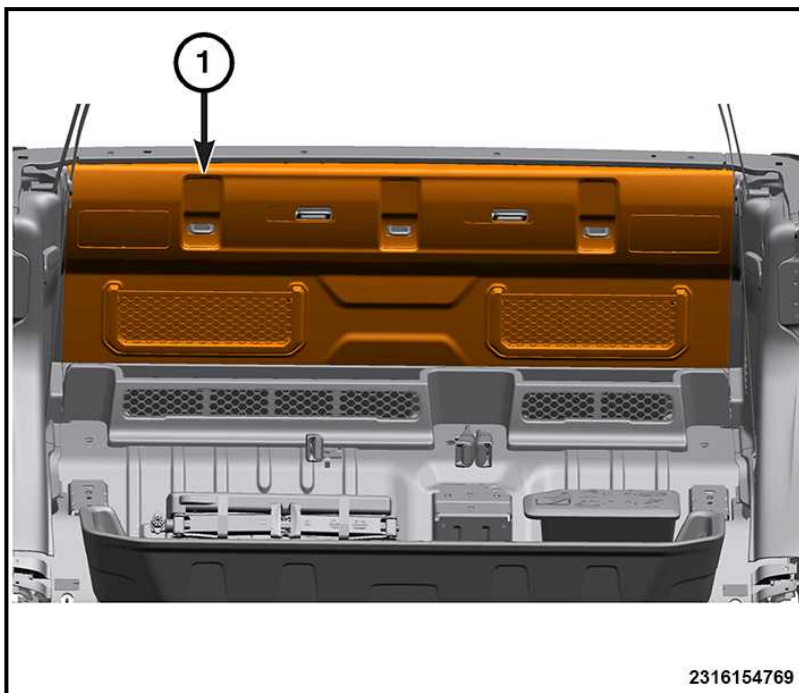


3. To remove the rear cab trim panel lower storage bin (2), remove the storage bin liner and remove the four fasteners (1).
4. Using a trim stick or equivalent, release the retaining clips from the rear of the bin and remove storage bin from rear cab panel.



INSTALLATION

1. Positioning the rear cab storage bin (2) into place and engage the retaining clips to the rear cab panel. Install the four fasteners (1), tighten them securely. Install storage bin liner.



2. Position the rear cab trim panel (1) to the rear cab panel and install it by inserting retaining clips fully into the rear cab panel.
3. Install the rear seats. Refer to [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

SUPPORT, VISOR

REMOVAL AND INSTALLATION

VISOR SUPPORT

REMOVAL



1 - Screw

1. Remove the screw, and the sun visor support.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

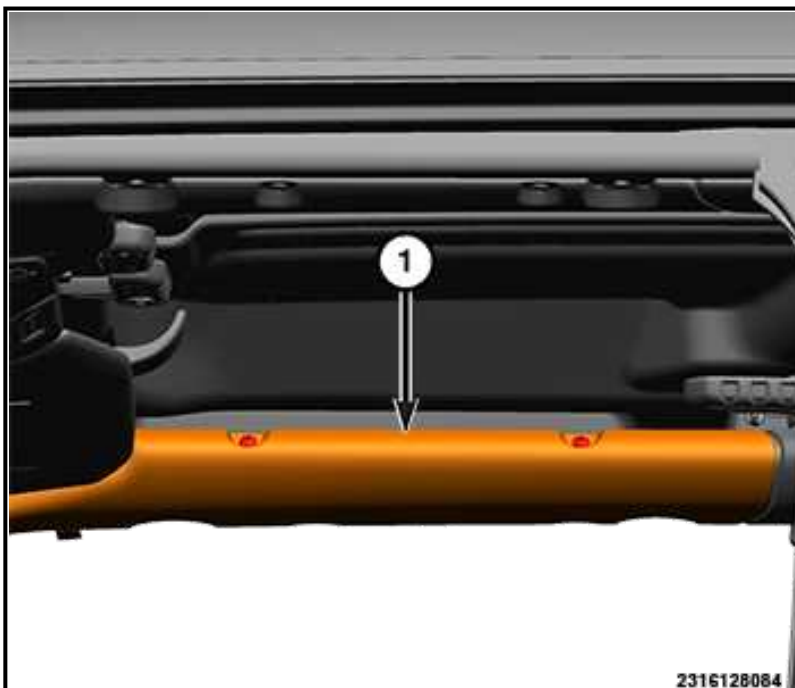
- Install the sun visor support screw and tighten securely.

VISOR

REMOVAL AND INSTALLATION

VISOR

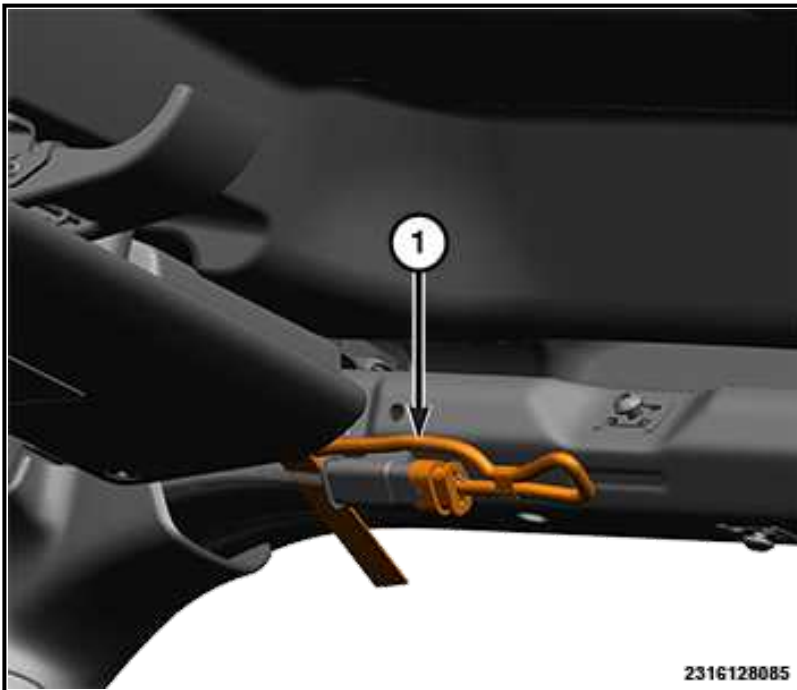
REMOVAL



1 - Sport Bar Cover

1. Remove the four screws from the front door sport bar cover and remove cover from vehicle.

NOTE: If equipped with power sliding top, open the top and use a straight driver to remove the upper fasteners.



1 - Wire Harness Connector

2. Disconnect wire harness connector for the visor.



1 - Screws

2 - Support

3. Release the visor from the support.
4. Remove the screws and the visor.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All screws are tightened securely.

PAINT

TECHNICAL SPECIFICATIONS

SPECIFICATIONS

Because of late model changes to the available paint colors for each vehicle the current color codes can be found on the Vehicle Certification Label. Refer to VEHICLE CERTIFICATION LABEL, DESCRIPTION.

NOTE: Exterior color codes are shown in the chart as the option code. The code on the Vehicle Certification Label is a three digit code but the first digit will be designated as a "P" for primary color or "Q" for secondary color.

PAINT COLOR INFORMATION	INFORMATION LOCATION
2020 - Paint Color Chart	Refer to <u>2020 PAINT CODES</u> .
2021 - Paint Color Chart	Refer to <u>2021 PAINT CODES</u> .
2022 - Paint Color Chart	Refer to <u>2022 PAINT CODES</u> .
2023 - Paint Color Chart	Refer to <u>2023 PAINT CODES</u> .

2020 PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	COLOR CODE
Black/Piano Black Clear Coat	DX8
Bright White Clear Coat	GW7
Billet Silver Metallic Clear Coat	JSC
Granite Crystal Metallic Clear Coat	LAU
Hydro/Laser Blue Pearl Coat	MBJ
Firecracker Red/Speed Red Metallic Clear Coat	MRC
Ceramic/Sting Gray	PDN
Gobi Clear Coat	RUA
Punk'n Pearl Coat	SE4
Gator Clear Coat	VGW

INTERIOR COLORS

INTERIOR COLOR	OPTION CODE	COLOR CODE
Black	X9	DX9
Global Black / Seal Grey	TA	TX7 / SA5
Black / Dark Saddle	TV	DX9 / VT9
Sandstone	T5	XT5

2021 PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	COLOR CODE
Black/Piano Black Clear Coat	DX8
Bright White Clear Coat	GW7

EXTERIOR COLOR	COLOR CODE
Billet Silver Metallic Clear Coat	JSC
Gecko Clear Coat	KFM
Nacho/Dozer/Yorange Clear Coat	KY5
Granite Crystal Metallic Clear Coat	LAU
Hydro/Laser Blue Pearl Coat	MBJ
Firecracker Red/Speed Red Metallic Clear Coat	MRC
Velvet Red/Passion Red/Red Pearl Coat	NRV
Ceramic/Sting Gray	PDN
Sarge Green Clear Coat	PGG
Gobi Clear Coat	RUA
Punk'n Pearl Coat	SE4
Gator Clear Coat	VGX

INTERIOR COLORS

INTERIOR COLOR	OPTION CODE	COLOR CODE
Black	X9	DX9
Global Black / Steel Grey	TA	TX7 / SA5
Black / Dark Saddle	TV	DX9 / VT9
Sandstone	T5	XT5

2022 PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	COLOR CODE
Black/Piano Black Clear Coat	DX8
Bright White Clear Coat	GW7
Billet Silver Metallic Clear Coat	JSC
Gecko Clear Coat	KFM
Nacho/Dozer/Yorange Clear Coat	KY5
Granite Crystal Metallic Clear Coat	LAU
Hydro/Laser Blue Pearl Coat	MBJ
Firecracker Red/Speed Red Metallic Clear Coat	MRC
Snazzberry/Velvet Red/Passion Red/Red Pearl Coat	NRV
Ceramic/Sting Gray	PDN
Sarge Green Clear Coat	PGG
Gobi Clear Coat	RUA
Punk'n Pearl Coat	SE4
Atomic/Zynith Silver Metallic Clear Coat	SSE
Gator Clear Coat	VGX
Minty/Earl Clear Coat	WGP
High Velocity Clear Coat	WJF

INTERIOR COLORS

INTERIOR COLOR	OPTION CODE	COLOR CODE
Black	X9	DX9
Global Black / Steel Grey	TA	TX7 / SA5
Black / Dark Saddle	TV	DX9 / VT9
Sandstone	T5	XT5

2023 PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	COLOR CODE
Black/Piano Black Clear Coat	DX8
Bright White Clear Coat	GW7
Granite Crystal Metallic Clear Coat	LAU
Hydro Blue Pearl Coat	MBJ
Firecracker Red Metallic Clear Coat	MRC
Sting Gray Clear Coat	PDN
Sarge Green Clear Coat	PGG
Punk'n Pearl Coat	SE4
Zynith Silver Metallic Clear Coat	SSE
Earl Clear Coat	WGP
High Velocity Clear Coat	WJF

INTERIOR COLORS

INTERIOR COLOR	OPTION CODE	COLOR CODE
Black	X9	DX9
Global Black / Steel Grey	TA	TX7 / SA5
Black / Dark Saddle	TV	DX9 / VT9
Black / Heritage Tan	T5	DX9 / XT5

REMOVABLE TOP, HARD

STANDARD PROCEDURE

FREEDOM PANEL FIT INSTRUCTIONS

	2022300230 - Gauges, Clearance Measurement, Non-Metallic
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The following procedure provides instructions to properly fit the FREEDOM PANELS, also called (LH and RH) modular top panels.

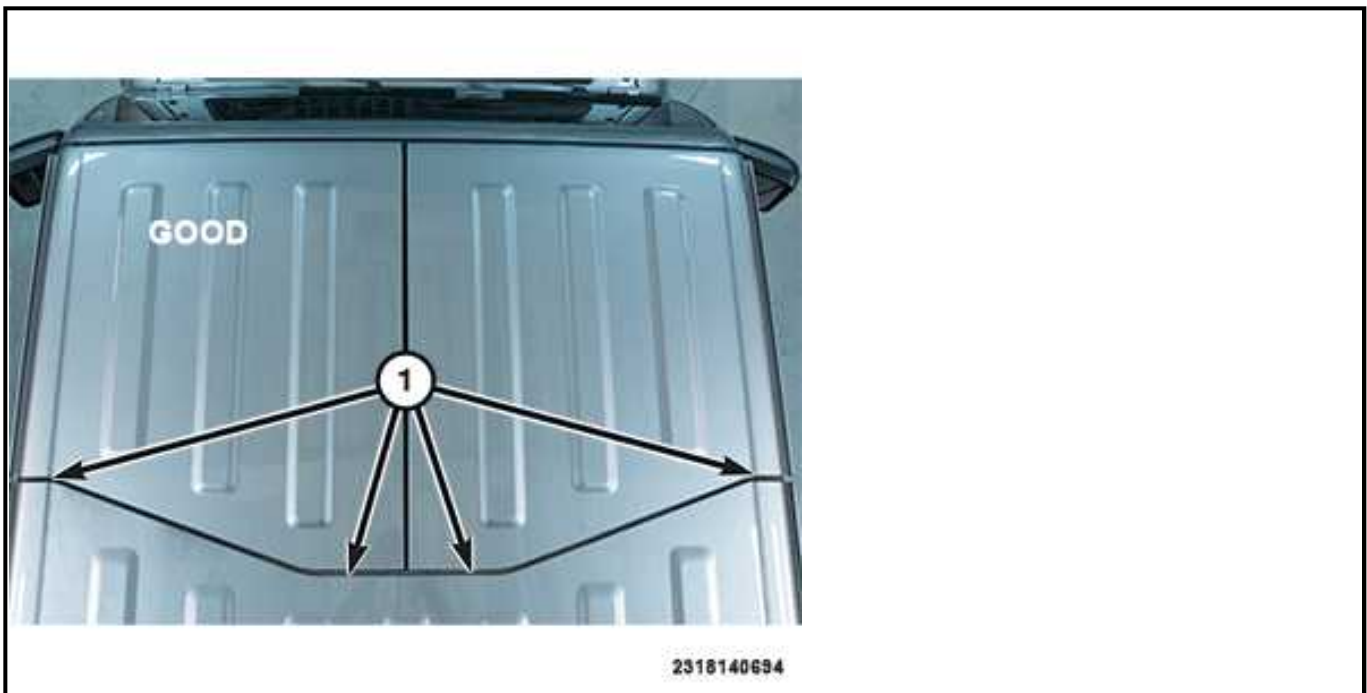
This procedure will require a MOPAR essential tool (2022300230)



Disassemble the gauges, then reassemble to have only 8mm of gauges (1) as shown in illustration.



This graphic shows Freedom Panels (1) that do not meet the gap specification of 8mm.



This graphic shows Freedom Panels that do meet the gap specification of 8mm at the four areas of measurement.

1. Review the adjustment video for greater detail.
2. Remove the LH modular top panel.

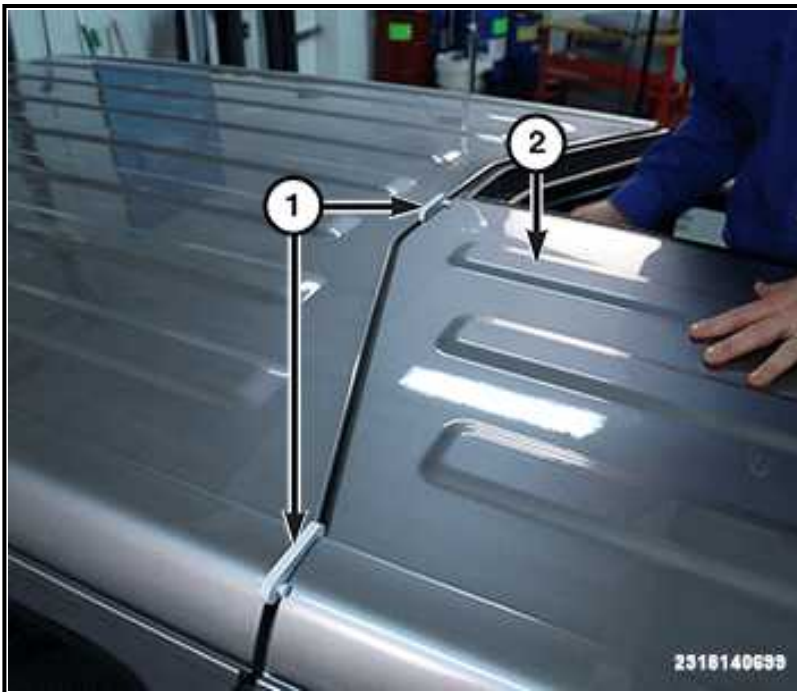


3. Lower the RH visor (2), unhook and swing it forward to access the front receiver.
4. Open the RH receiver clamp (3).
5. Remove the felt patches from the bolt heads on the RH front receiver bracket, then **LOOSEN** the two receiver bracket bolts (1). Feel the bracket by hand to make sure it will move for adjustment.

NOTE: Save the felt patches to put back on the bolt heads.



6. Open the remaining clamps (1) on the RH modular top panel.



7. Position the RH modular top panel (2) till the 8mm gap gauges (1) will fit firmly between the rear hard top panel and the RH modular top panel, on the RH side of the vehicle just above the B-pillar and at the center of the vehicle.
8. When the 8mm gap has been achieved, close all the clamps, **EXCEPT** the front center clamp. Check that the panel did not move.

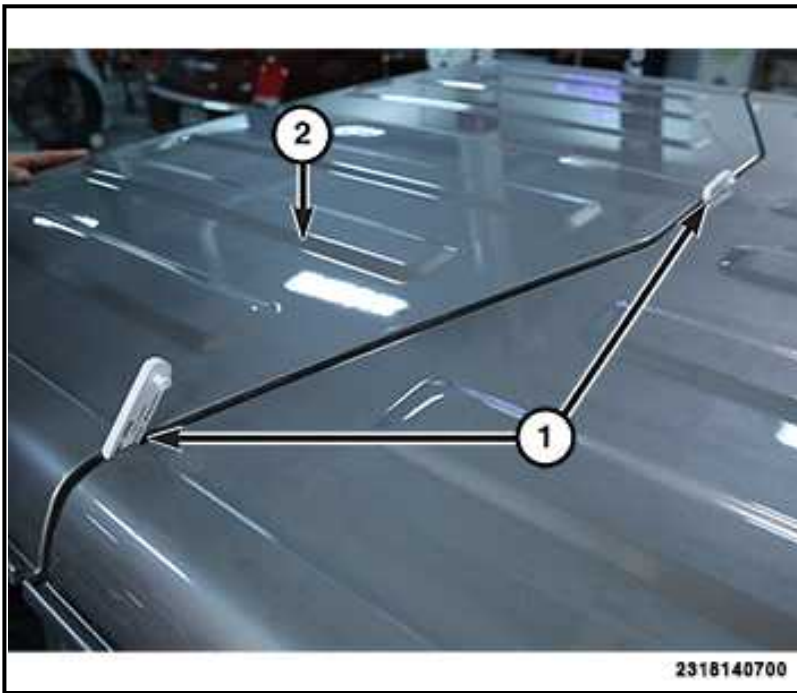


9. Tighten the **OUTBOARD** hard top front receiver bracket bolt to the proper. Refer to [**TORQUE SPECIFICATIONS**](#) .
10. Tighten the **INBOARD** hard top front receiver bracket bolt to the proper. Refer to [**TORQUE SPECIFICATIONS**](#) .
11. Close the front center RH modular top clamp (3).



12. Install the LH modular top panel onto the vehicle, **do not close any clamps** .
13. Lower the LH visor (1), unhook and swing it forward to access the front receiver.
14. Remove the felt patches from the bolt heads on the LH front receiver bracket, then **LOOSEN** the two receiver bracket bolts (2). Feel the bracket by hand to make sure it will move for adjustment.

NOTE: **Save the felt patches to put back on the bolt heads.**



15. Position the LH modular top panel (2) till the 8mm gap gauges (1) will fit firmly between the rear hard top panel and the LH modular top panel, on the LH side of the vehicle just above the B-pillar and at the center of the vehicle.



16. When the 8mm gap has been achieved, close all the clamps (1), **EXCEPT** the front center clamp (2). Check that the panel did not move.



17. Tighten the **OUTBOARD** hard top front receiver bracket bolt to the proper. Refer to [**TORQUE SPECIFICATIONS**](#) .
18. Tighten the **INBOARD** hard top front receiver bracket bolt to the proper. Refer to [**TORQUE SPECIFICATIONS**](#) .
19. Close the front center LH modular top clamp (3).
20. Place the felt patches over the bolt heads.
21. Return the visors to the original position.
22. Using an 8mm gap gauge, verify the gaps. If the gaps are not correct, repeat the procedure.

FREEDOM PANEL FLUSHNESS INSTRUCTIONS



The following procedure provides instructions to properly adjust the FREEDOM PANELS, also called (left hand and right hand) modular top panels.

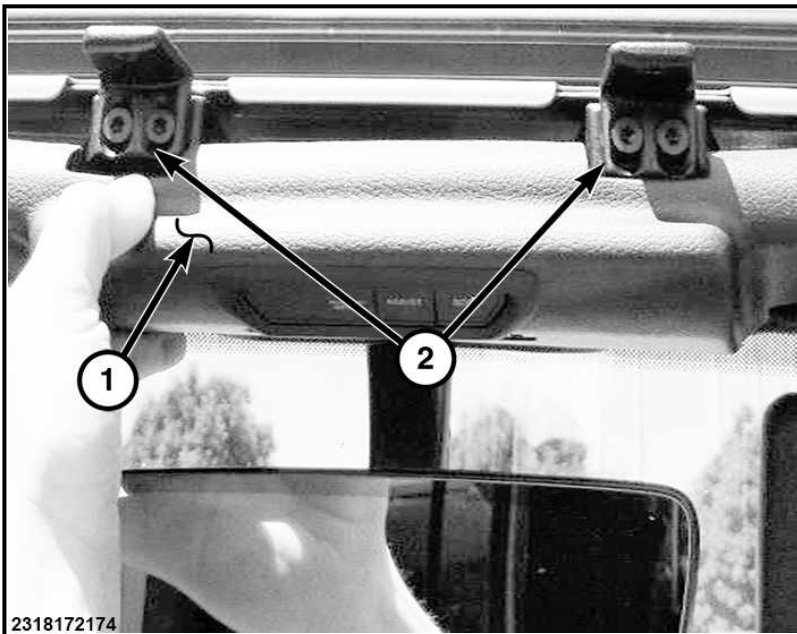
This graphic shows Freedom Panels (1) that do not meet the flushness specification at front to windshield (Panel to Panel).



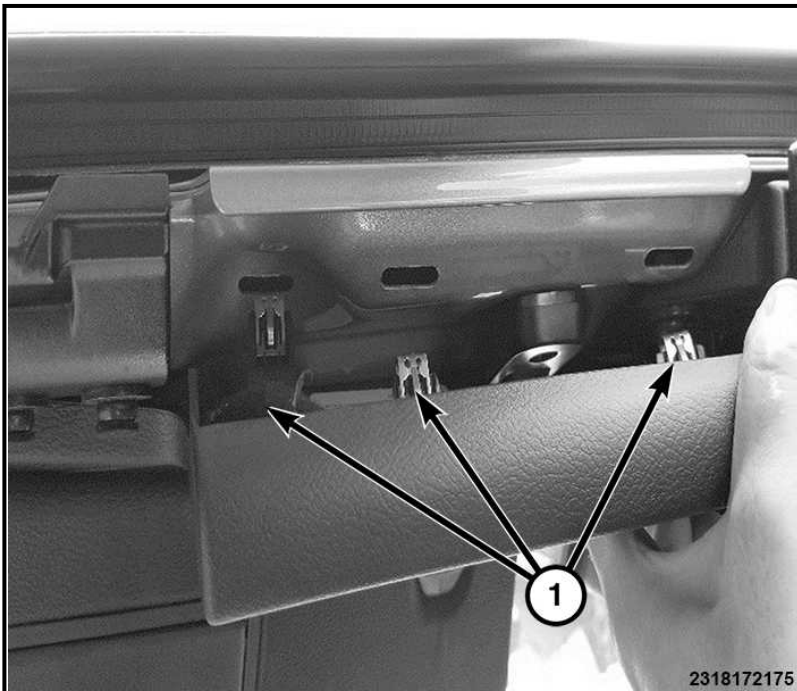
1. Remove the left hand modular top panel.
2. Lower the left hand visor (2), unhook and swing forward.



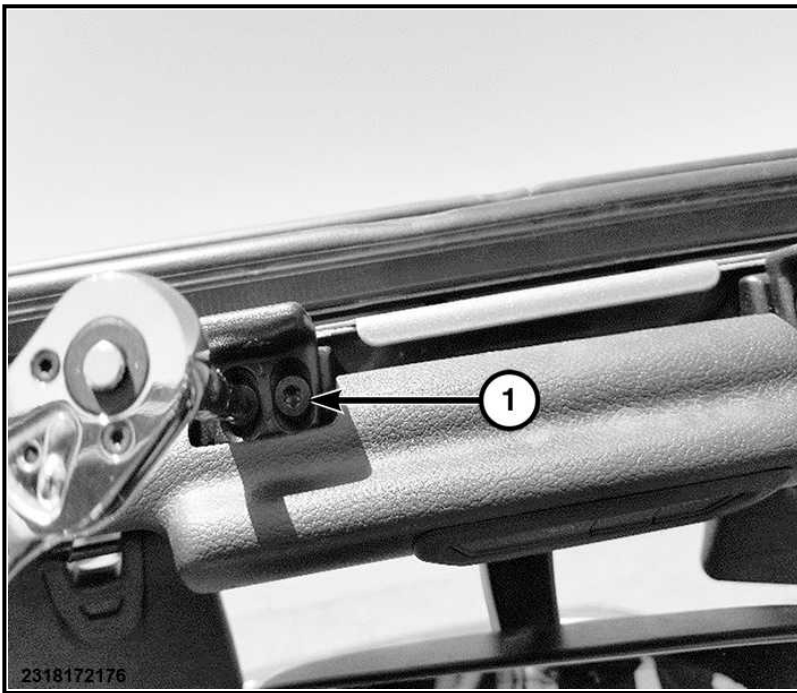
3. Remove the right hand modular top panel.
4. Lower the right hand visor (3), unhook and swing forward.



5. Pull down trim (1) covering the front center receivers (2).

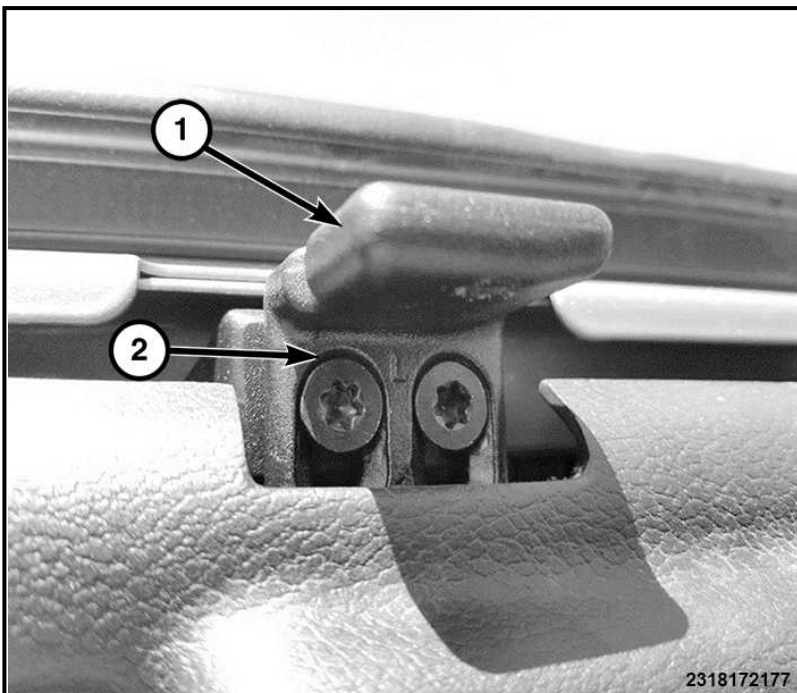


NOTE: Do not pull trim all the way off from the vehicle. Just enough to disengage the attachment clips (1) on each side.

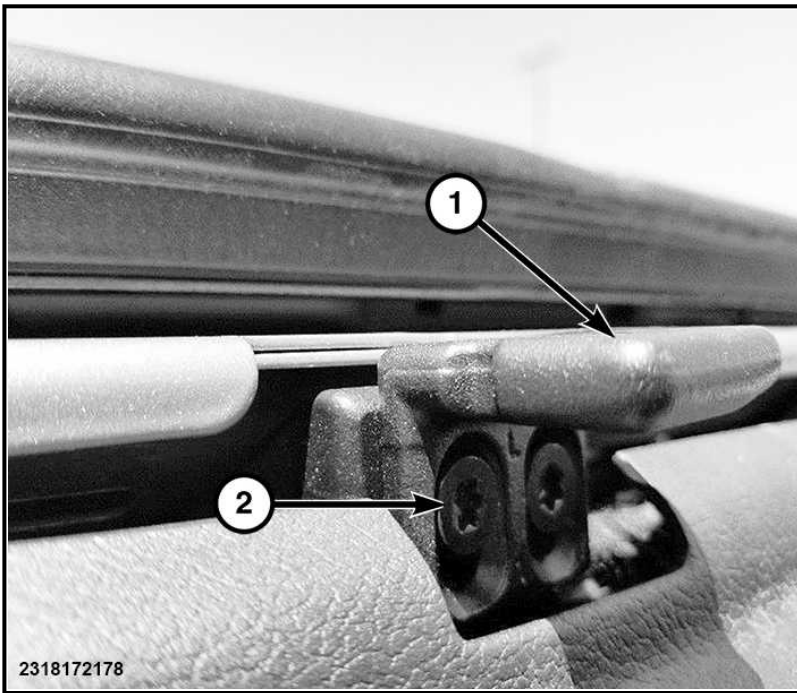


6. Loosen the two receiver bracket bolts (1). Feel the bracket by hand to make sure it will move for adjustment.

NOTE: Do not remove screws from the bracket, loosen only.



7. Adjust receiver (1) down. Do not adjust receiver all the way down to the bottom (2). The panels will over compress the windshield seal and increase latching at the front.



8. Tighten bolts (2) on the front receiver. Make sure the bracket (1) stays level and does not rotate.



9. Install the right hand and left hand modular panels and verify flushness between the panels and to the front windshield.

10. Remove both the right hand and left hand modular panels to secure trim (1).

11. Install the right hand and left hand modular panels return visors to the original position.

NOTE: Be careful not to bend the clips when installing trim (see Step 5). Pull trim down and line up clips prior to securing.

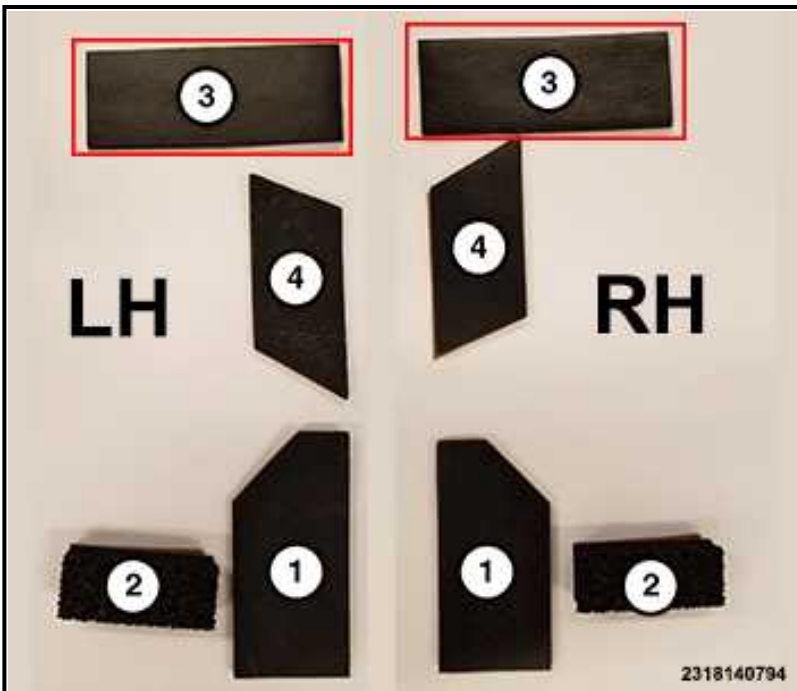
FREEDOM PANEL FOAM INSTALLATION

A-PILLAR FOAM

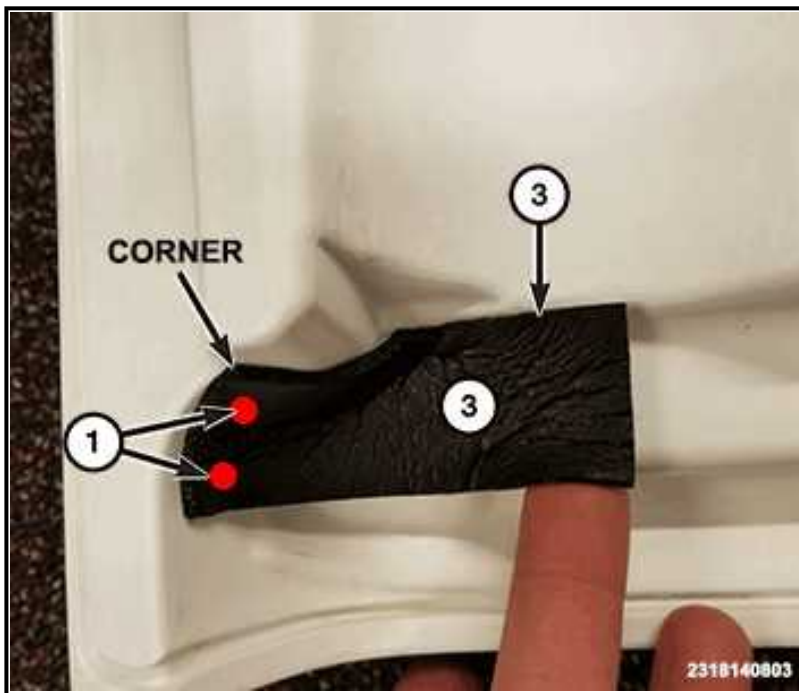
1. Remove the Freedom Panel and place it on a padded working surface.



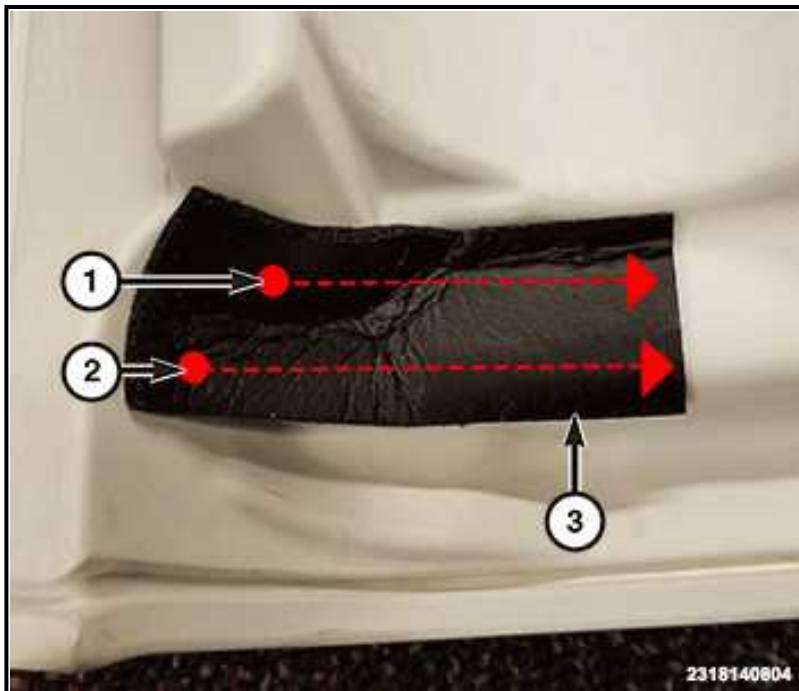
2. Remove the foam pads (3 and 4) from the Freedom Panel and remove any glue residue with a glue removing solvent.



3. Identify the foam pad (3) in the foam service parts.



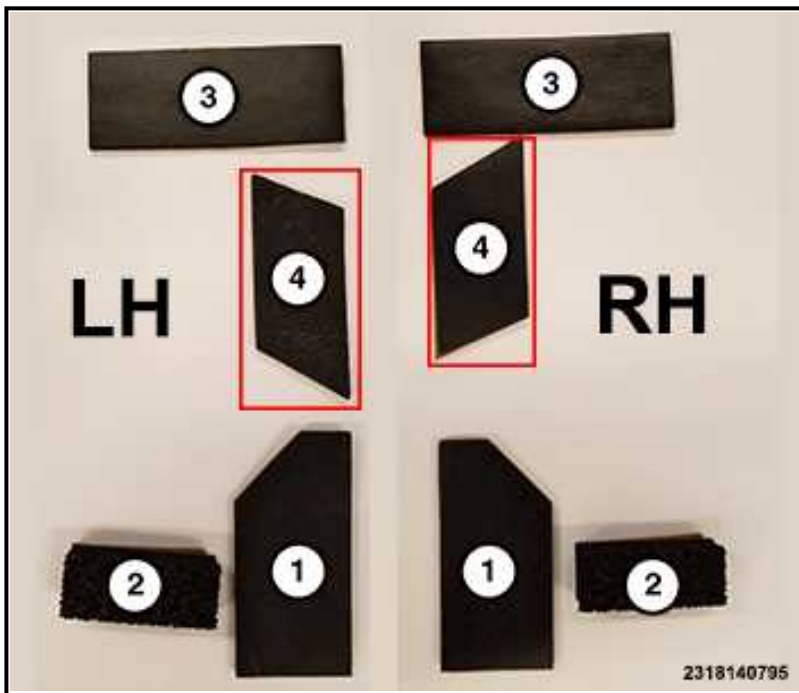
4. Locate the corner of the **NEW** foam pad (3) at the part corner as shown in illustration, then press (1) to engage the adhesive.



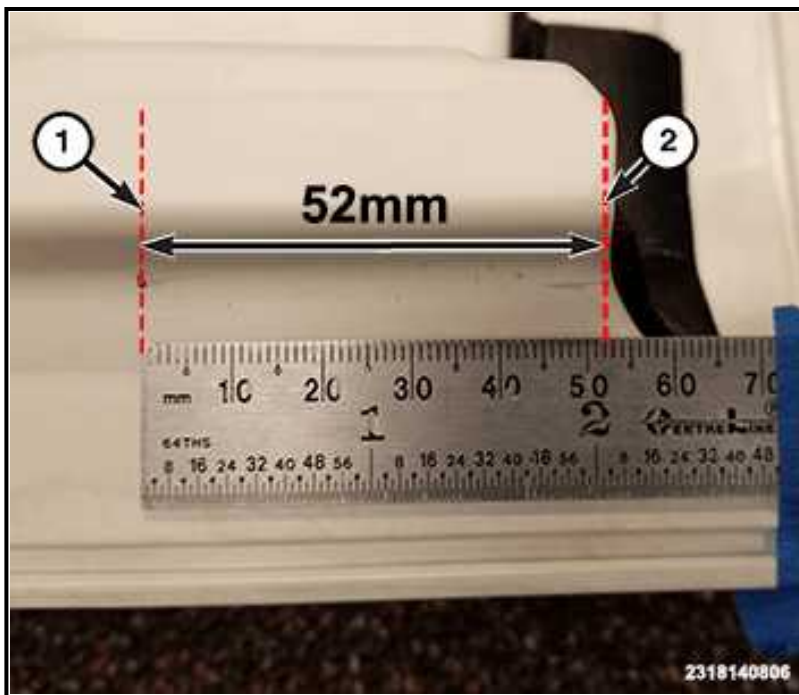
5. Roll the foam down on the flat surface and press (1), then push down along the flat surface and into the corner to engage the adhesive.
6. Press (2), then push down along the radius to engage the adhesive.

NOTE: It is acceptable if the foam rolls over the surface edge (3), but not necessary.

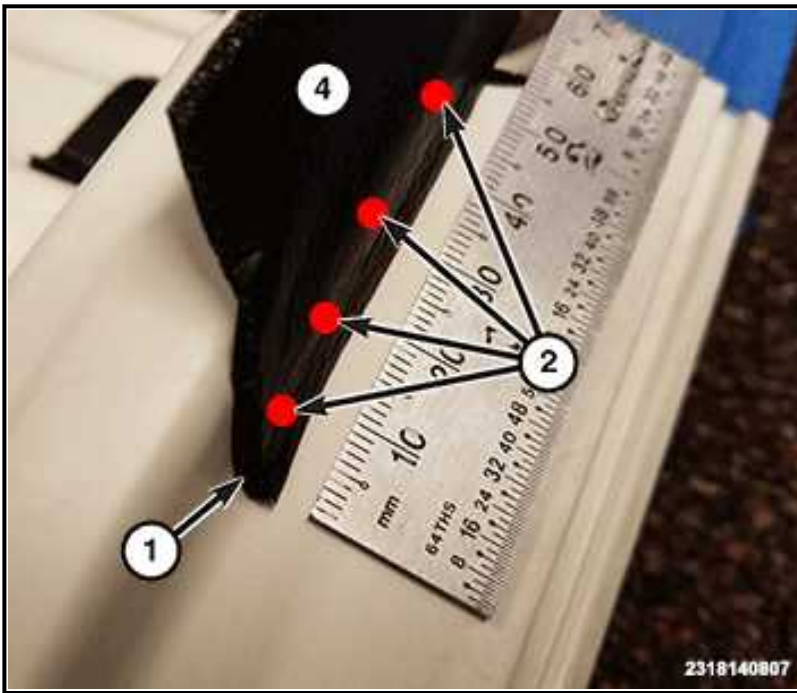
7. Firmly rub the entire foam pad to promote full adhesion.



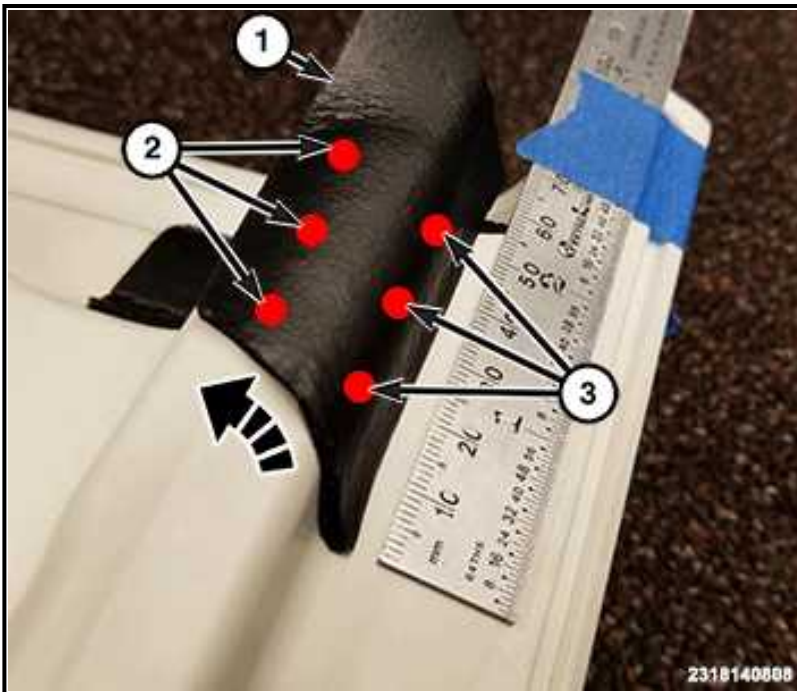
8. Identify the foam pad (4) in the foam service parts.



9. Using a scale, measure 52 mm from the part edge (2) and mark a line (1) to start the placement of the foam pad.

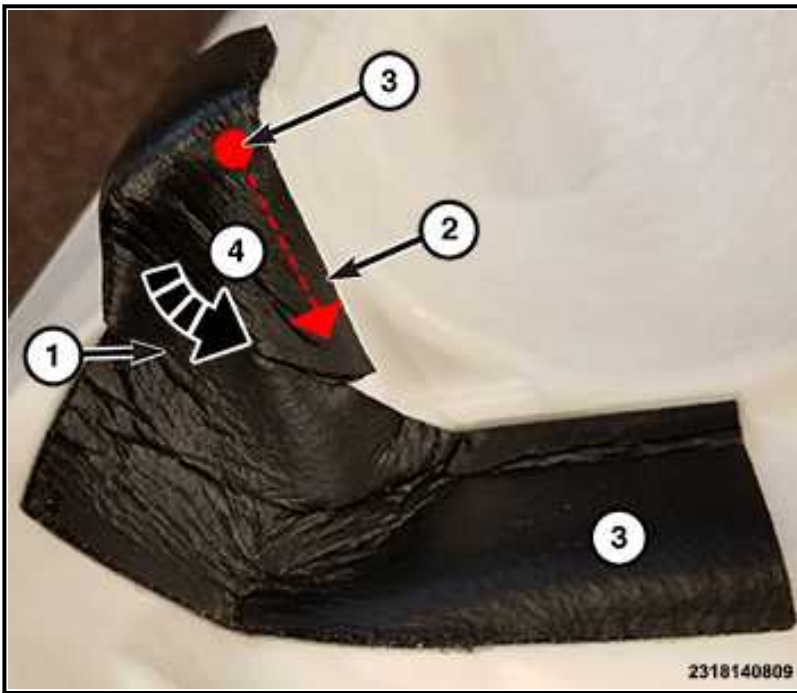


10. Locate the **NEW** foam pad (4) at the mark (1), then press (2) to engage the adhesive.



11. Roll the foam pad up the edge and press (3) first, then press (2) to engage the adhesive.

NOTE: The end (1) of the foam pad will hang over the edge.



12. Roll the end (2) down the edge and press (3), then push down along the flat surface to engage the adhesive.

NOTE:

Prevent the foam from bunching at the corner (1).

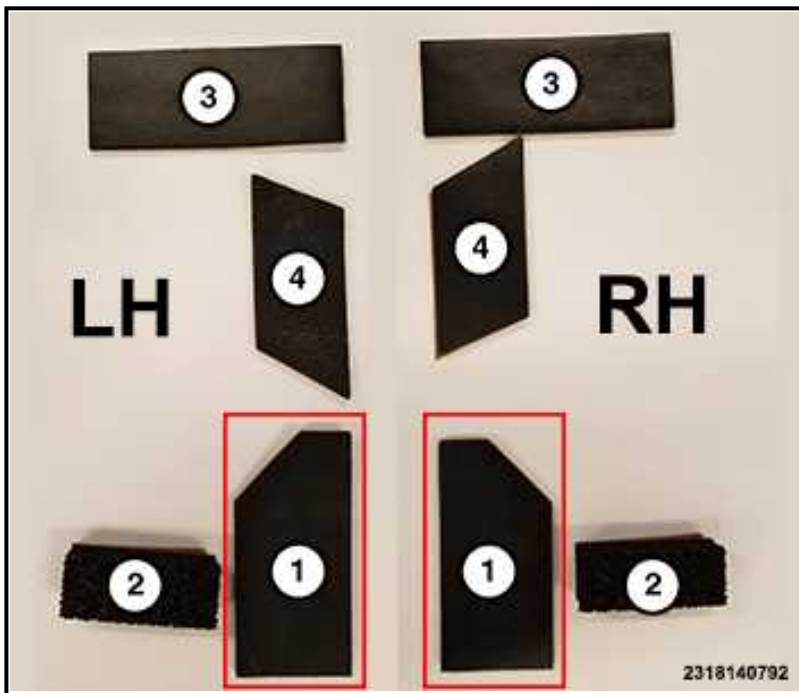
The foam pad (4) should overlap the foam pad (3) if installed correctly.

B-PILLAR OUTSIDE FOAM

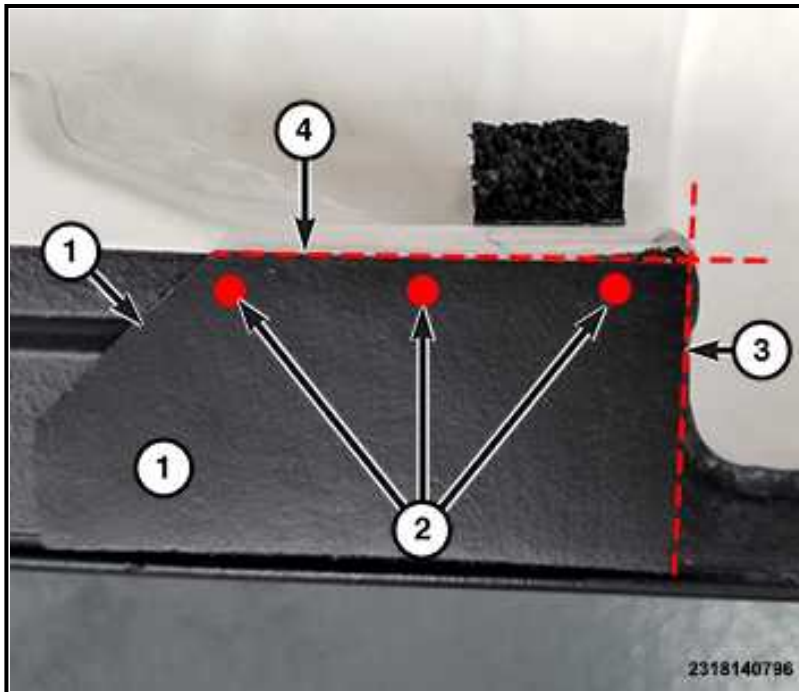
1. Remove the Freedom Panel and place it on a padded working surface.



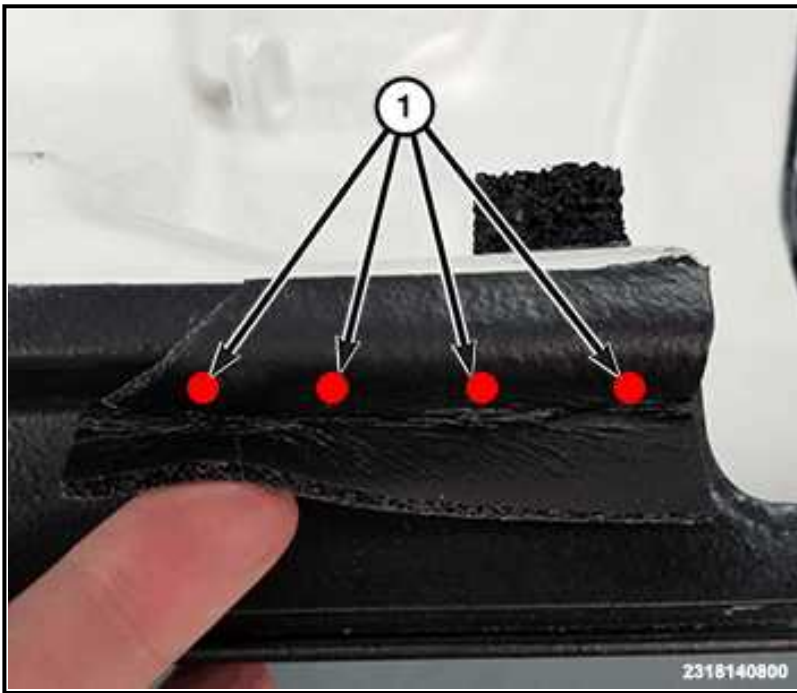
2. Remove the foam pad (1) from the Freedom Panel and remove any glue residue with a glue removing solvent.



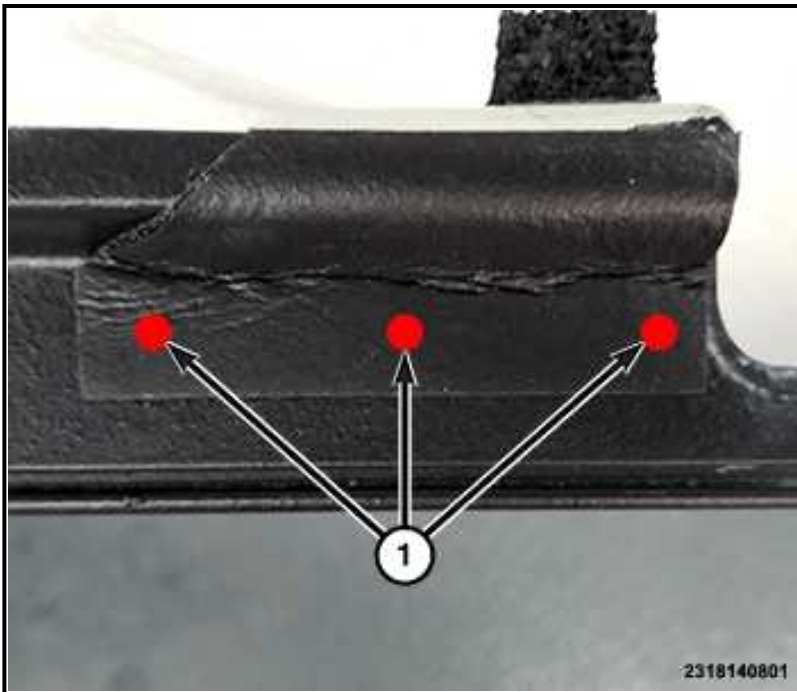
3. Identify the foam pad (1) in the foam service parts.



4. Locate the **NEW** foam pad (1) along the paint line (4) and the edge of the part (3), then press (2) to engage the adhesive.



5. Roll the foam pad down the edge and press (1) to engage the adhesive.



6. Push the foam pad into the corner, lay it on the flat surface and press (1) to engage the adhesive.

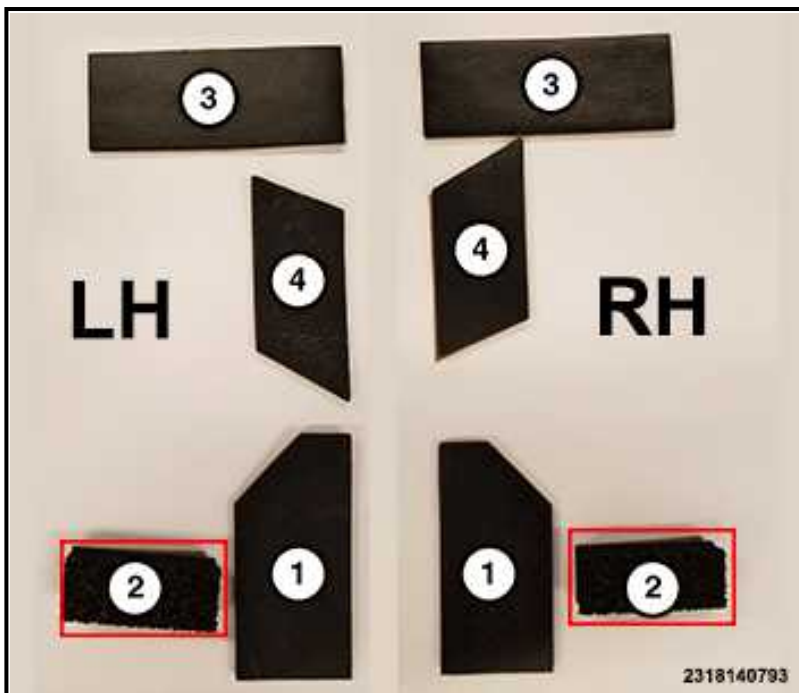
7. Firmly rub the entire foam pad to promote full adhesion.

B-PILLAR INSIDE FOAM

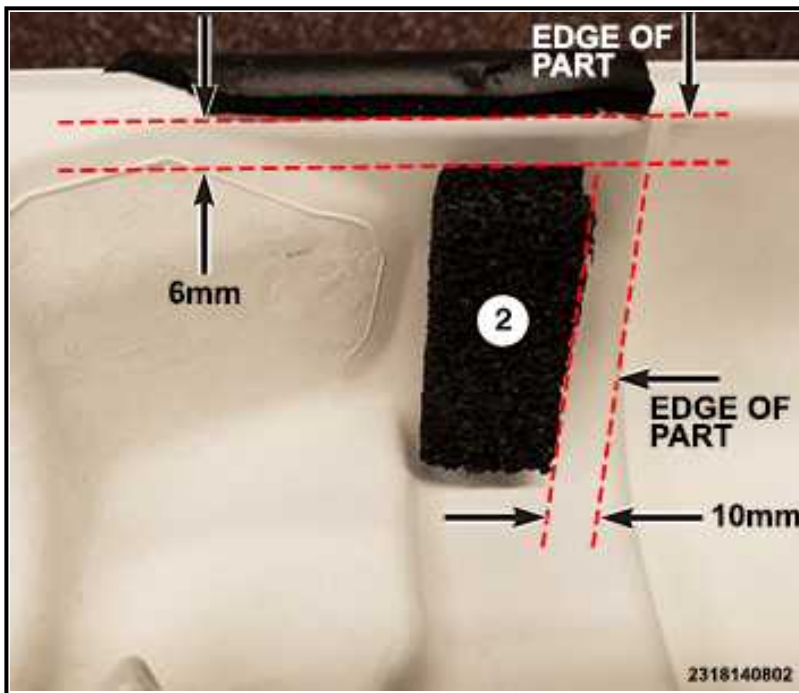
1. Remove the Freedom Panel and place it on a padded working surface.



2. Remove the foam pad (2) from the Freedom Panel and remove any glue residue with a glue removing solvent.



3. Identify the foam pad (2) in the foam service parts.

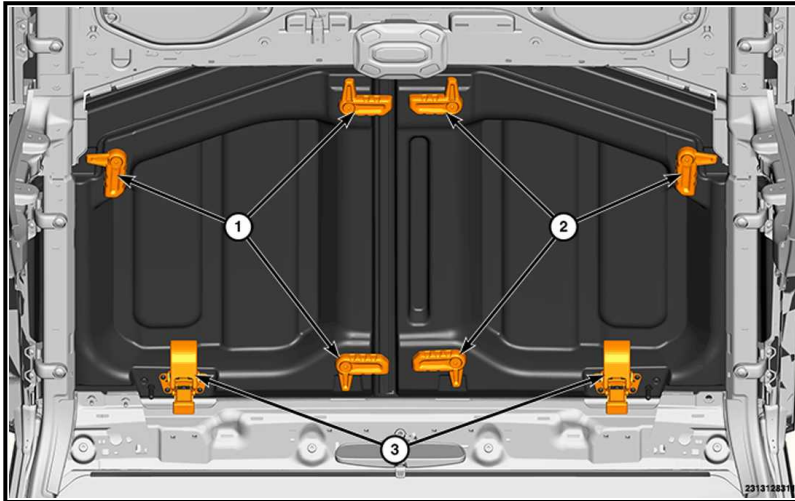


4. Locate the **NEW** foam pad (2) using the dimensions as shown in illustration.
5. Lay the foam pad and press to engage the adhesive. Firmly rub the entire foam pad to promote full adhesion.

REMOVAL AND INSTALLATION

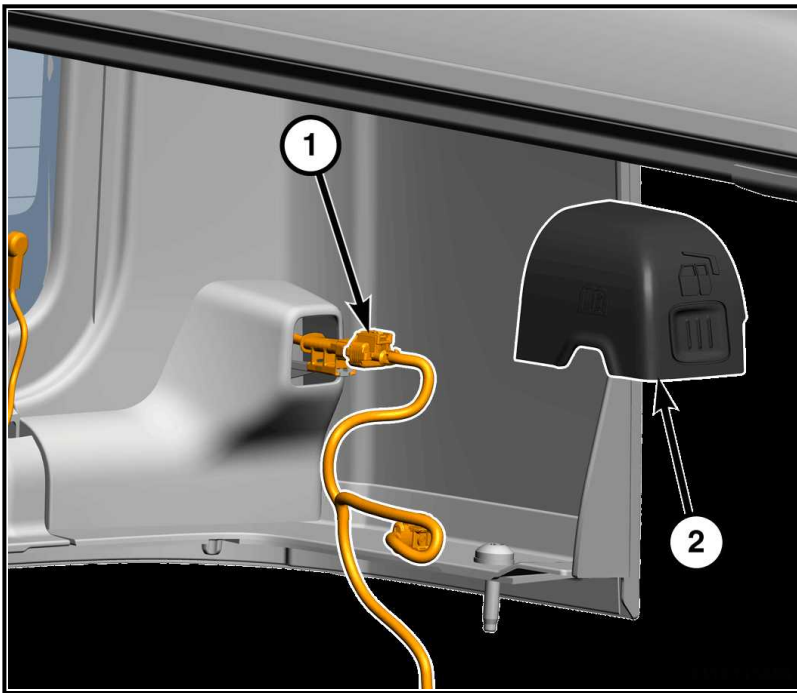
REMOVAL AND INSTALLATION

REMOVAL

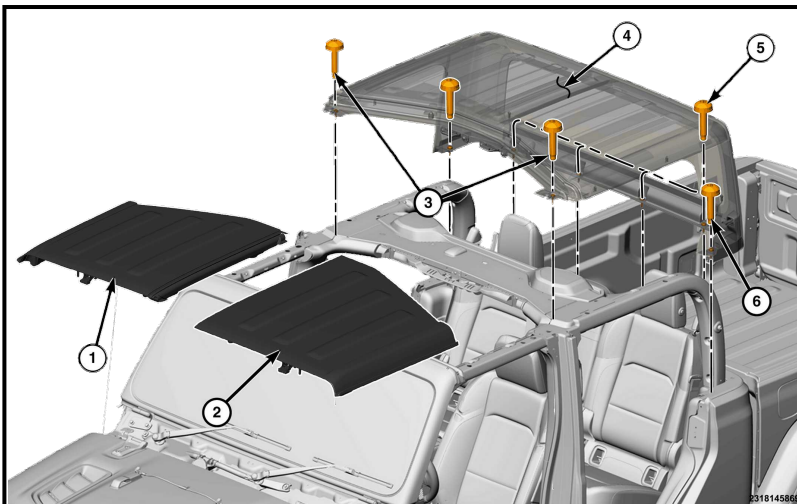


CAUTION: Be certain all fasteners are removed. Failure to follow these instructions will result in hardtop damage.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. From inside the vehicle, release the left (1) and right (2) clamps.
3. Release the front top clamps (3).



4. From the hardtop left rear corner, of the interior, remove the trim cover (2), disconnect the hardtop wire harness connector (1).

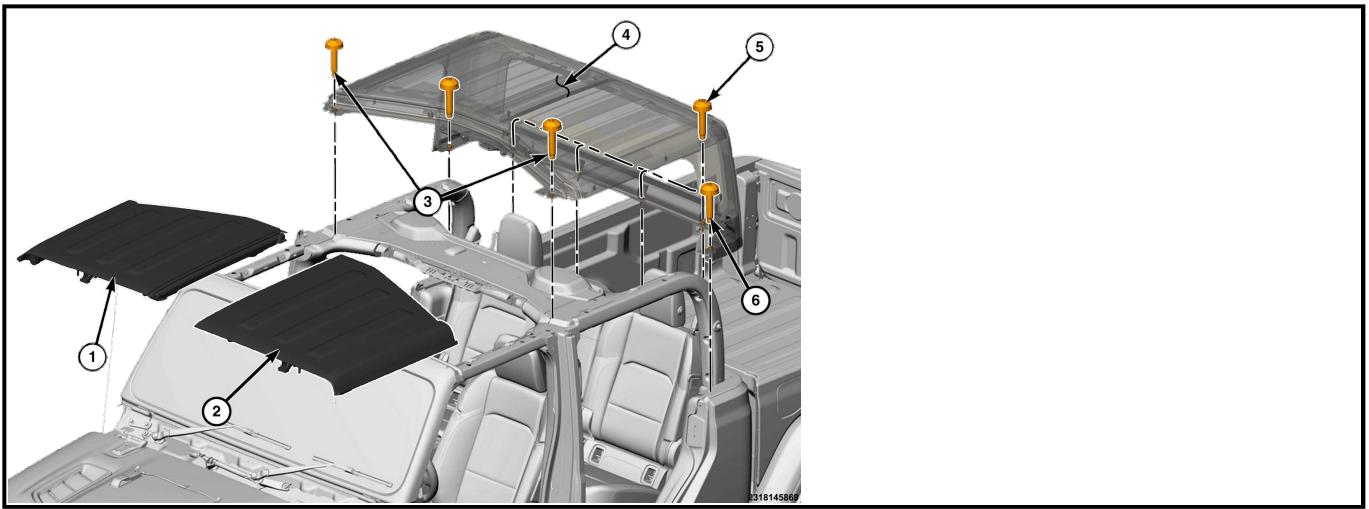


5. Remove the modular tops (1) and (2).
6. Remove the two front bolts (3).

CAUTION: Lifting the main hard top on or off will require the assistance of four people, one in each corner. Failure to lift the top as instructed may result in hard top damage.

7. Remove the two side bolts (6)
8. Remove the four rear bolts (5). Remove the main hard top (4) by lifting evenly, steadily and without flexing.

INSTALLATION



NOTE: To prevent water leaks, the seals and freedom top should be clear of dust and debris before installation.

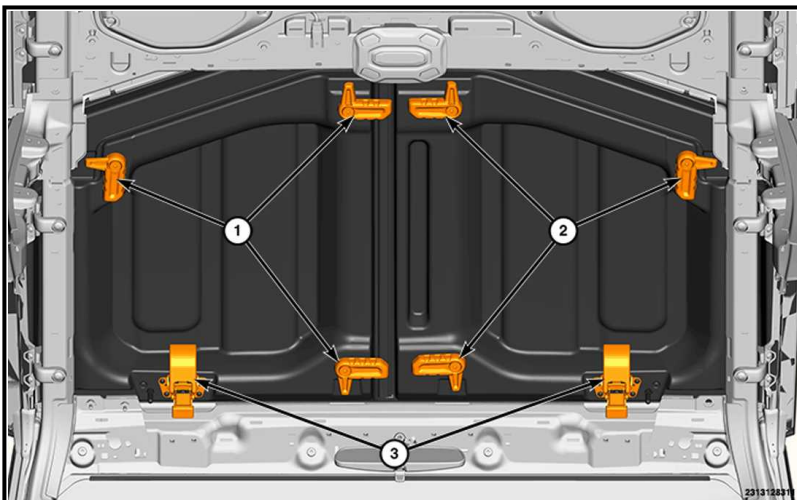
1. Install the main hard top (4) by lifting evenly, steadily and without flexing. Place onto the vehicle while lining up the alignment pins.

CAUTION: Verify the B and C-pillar seals are not folded up and are positioned correctly.

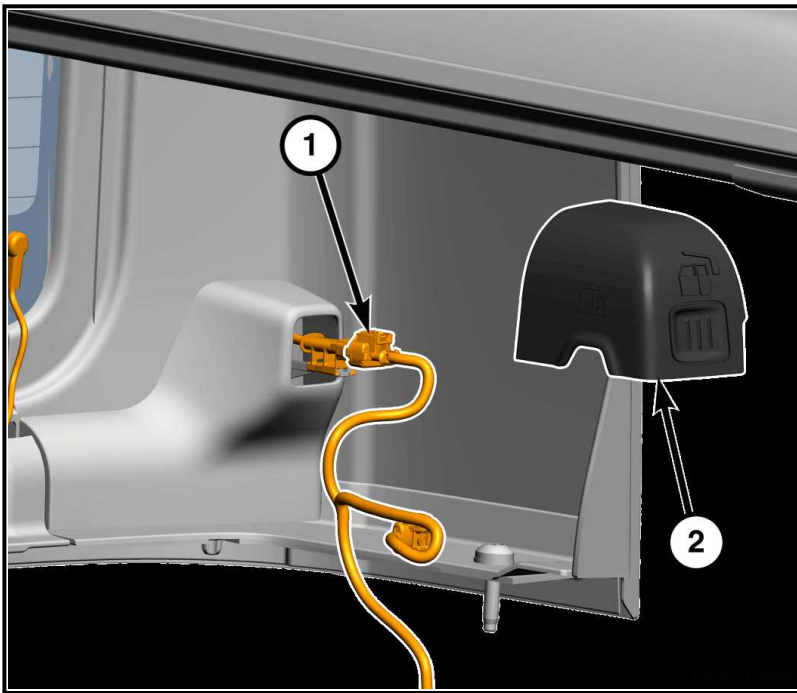
2. Install the two side bolts (6)
3. Install the four rear bolts (5).
4. Install the two front bolts (3).
5. Tighten the bolts to the proper Refer to [TORQUE SPECIFICATIONS](#) .

NOTE: Make sure all modular top latches are in the open position.

6. Position the modular tops (1) and (2) onto the vehicle with the right side top (1) being installed before the left side (2).



7. With the modular tops installed correctly onto the alignment pins, secure the front latches (3).
8. Secure the right side clamps (2) fully.
9. Secure the left side clamps (1) fully.



10. Connect the wire harness connector (1) and install the trim cover (2).

11. Connect the negative battery cable(s). Refer to the appropriate service information .

TUBE, REMOVABLE TOP DRAIN

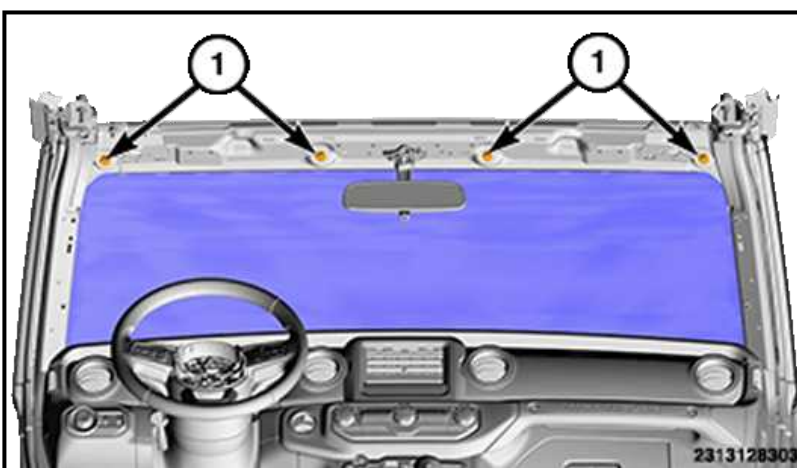
REMOVAL AND INSTALLATION

REMOVABLE TOP DRAIN TUBES

FRONT

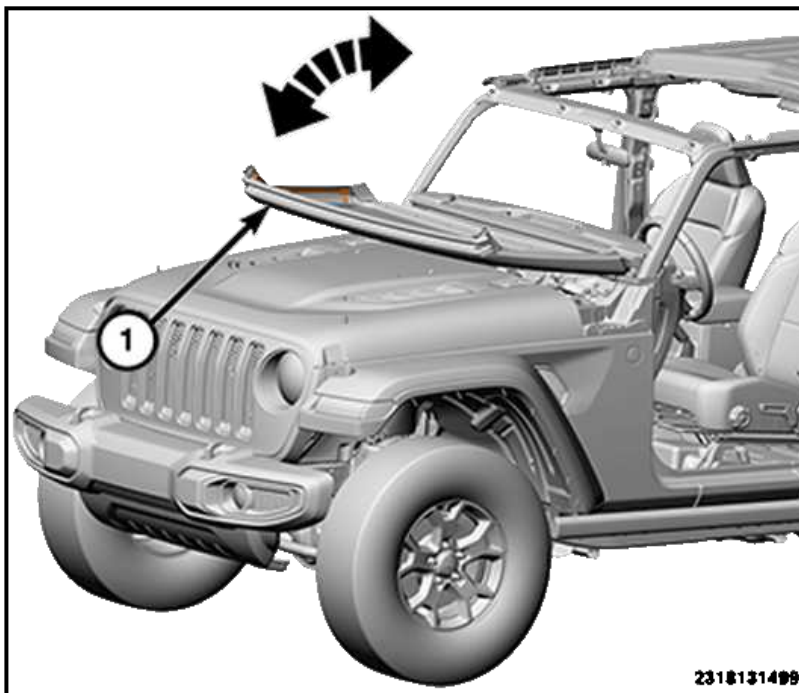
REMOVAL

1. Remove the Freedom Tops, if equipped Refer to [REMOVABLE TOP, HARD, REMOVAL AND INSTALLATION](#).
2. Open the soft top if equipped.
3. Remove the wiper arms Refer to [ARM, WIPER, REMOVAL AND INSTALLATION](#) .



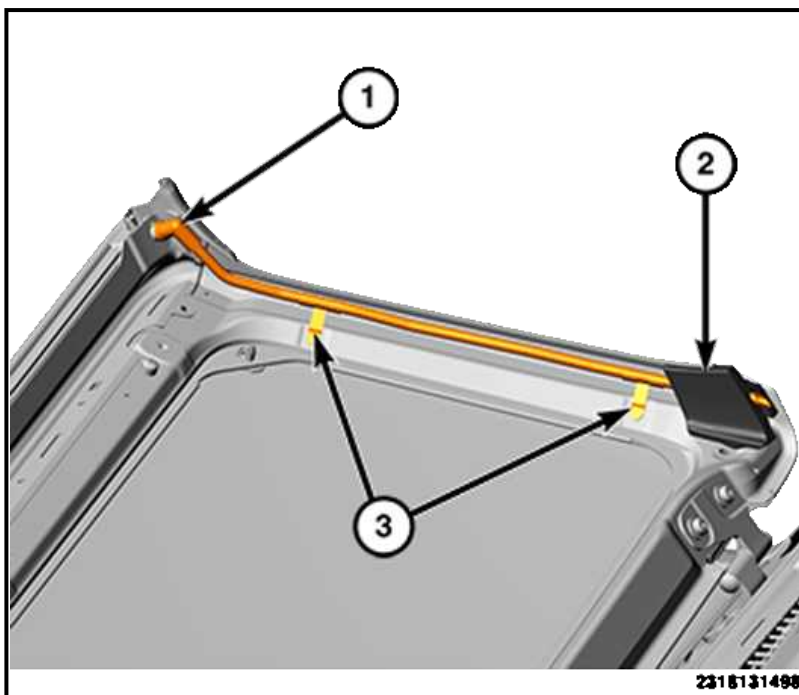
1 - Bolts

4. Remove the bolts securing the upper windshield frame to the header.



1 - Windshield

5. Fold the windshield down onto the hood.



1 - Drain

2 - Seal

3 - Retaining Clips

6. Release the tube from the drain.

7. Separate the retaining clips and remove the tube from the seal.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

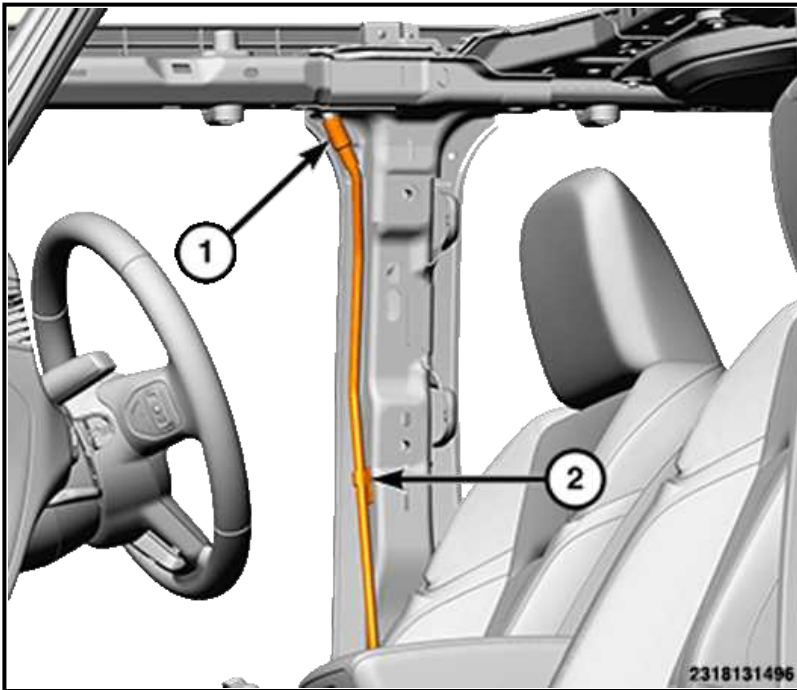
- Verify all clips are fully secured.

- Tighten the bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

REAR

REMOVAL

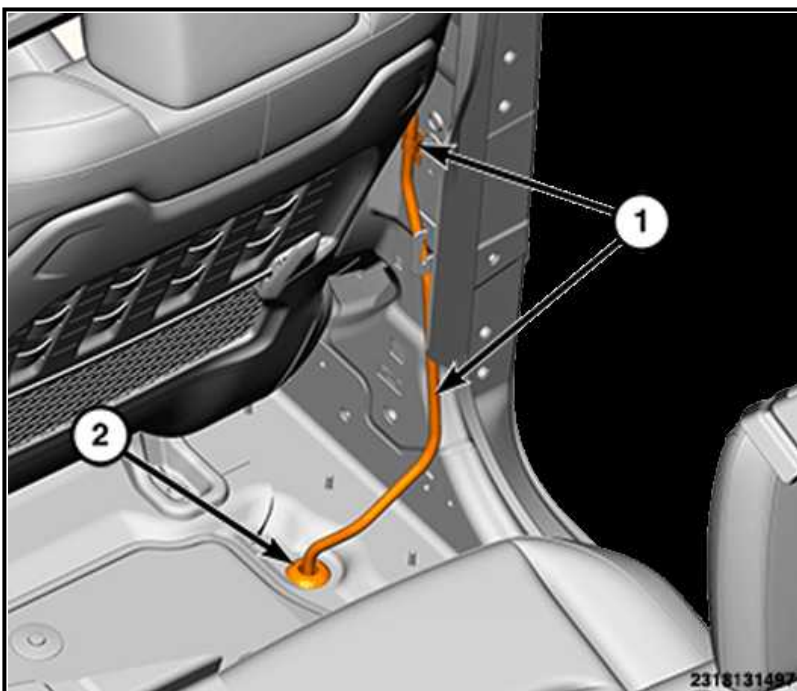
1. Remove the B-pillar trim. Refer to [PANEL, B-PILLAR TRIM, LOWER, REMOVAL AND INSTALLATION](#)[PANEL, B-PILLAR TRIM, UPPER, REMOVAL AND INSTALLATION](#).



1 - Drain

2 - Retaining Clips

2. Release the tube from the drain.
3. Separate the retaining clips.



1 - Tube

2 - Grommet

4. Release the grommet from the floor board.
5. Separate the retaining clips and remove the tube.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify all clips are fully secured.

SEATS, FIRST ROW

WARNING

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING:

During and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the Chrysler MoparB® parts catalog. Failure to follow these instructions may result in personal injury or death.

WARNING:

To avoid personal injury or death, the fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Anytime a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the FCA US LLC MoparB® parts catalog. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING:

Never strike or drop the Occupant Restraint Controller (ORC), as it can damage the impact sensor or affect its calibration. The occupant restraint controller contains the impact sensor, which enables the system to deploy the supplemental restraints. If an airbag control module is accidentally dropped during service, the module must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper supplemental restraint deployment and serious or fatal injury.

COVER, SEAT BACK

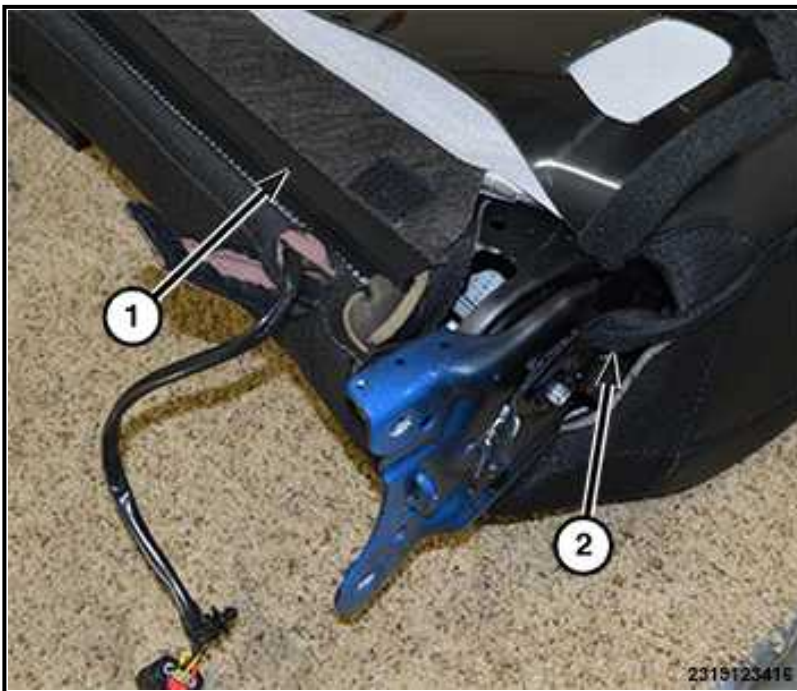
REMOVAL AND INSTALLATION

WARNING:

Disable the airbag system before attempting any front seat diagnosis or service. Disconnect and isolate the negative battery (ground) cable and wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

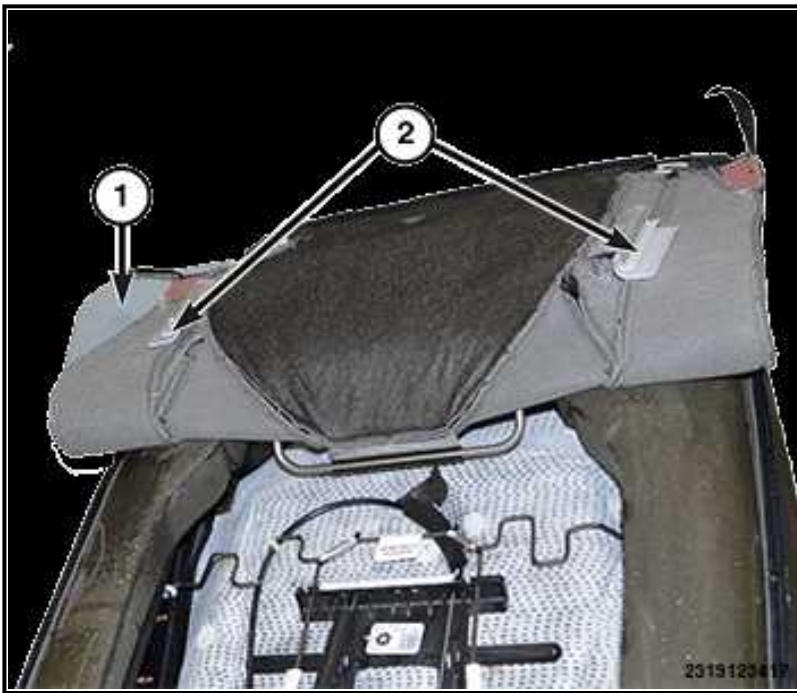
REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING.](#)
2. Remove the front seat back. Refer to [SEAT BACK, FRONT, REMOVAL AND INSTALLATION.](#)
3. Remove the headrest from the seat back.



1 - J-hook Retainer
2 - Zipper

4. Open the zippers on each side of the seatback cover and release the J-hook strip (1).



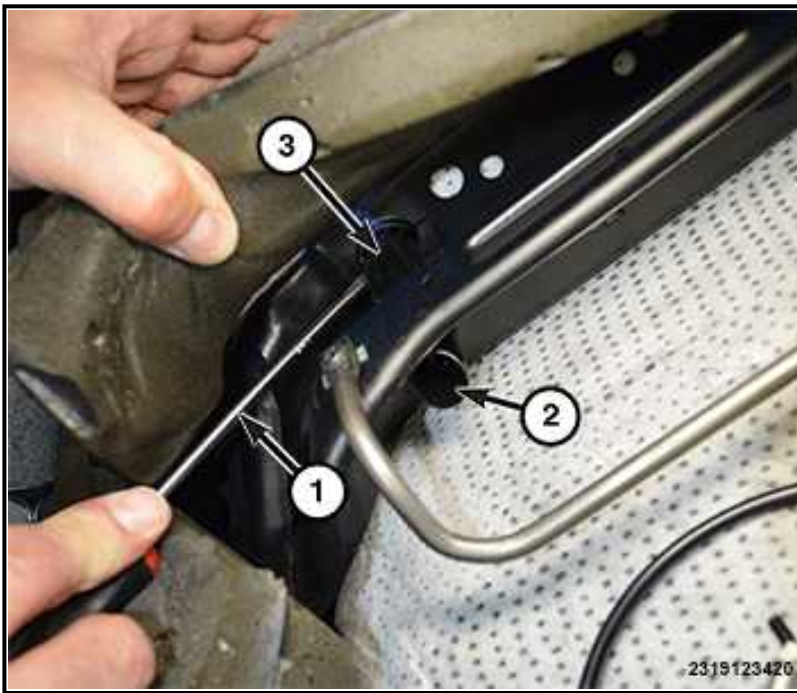
- | |
|--------------------|
| 1 - Seat Back Trim |
| 2 - Side Retainers |

5. Lift the seat back trim slightly and release the side retainers.



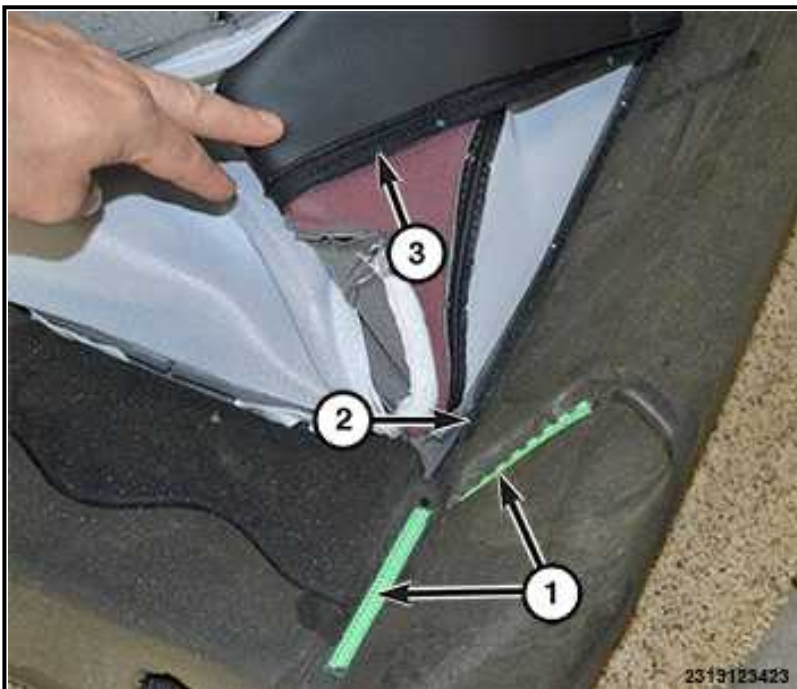
- | |
|----------------------|
| 1 - J-hook Retainers |
| 2 - Wire Harness |
| 3 - J-hook Retainer |

6. Release the J-hook retainers for the seat back cover.
7. Unclip the wire harness.



1 - Flat Bladed Tool
2 - Headrest Sleeve
3 - Tab

8. Pull the foam back, then using a flat bladed tool, push the tab and pull out the headrest sleeves.
9. Remove the seat air bag from the seat back frame, following all warnings and cautions. Refer to [AIR BAG, SEAT, REMOVAL AND INSTALLATION](#).
10. Remove the seat air bag from the chute and set aside.
11. Remove the seat back foam and seat back cover as an assembly, from the seat back frame.



1 - Hook and Loop Fasteners
2 - Hog Rings
3 - Seat Back Cover

12. Pull the seat back cover away from the seat foam, releasing the hook and loop fasteners first.
13. Cut the hog rings and remove the seat back cover from the foam.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

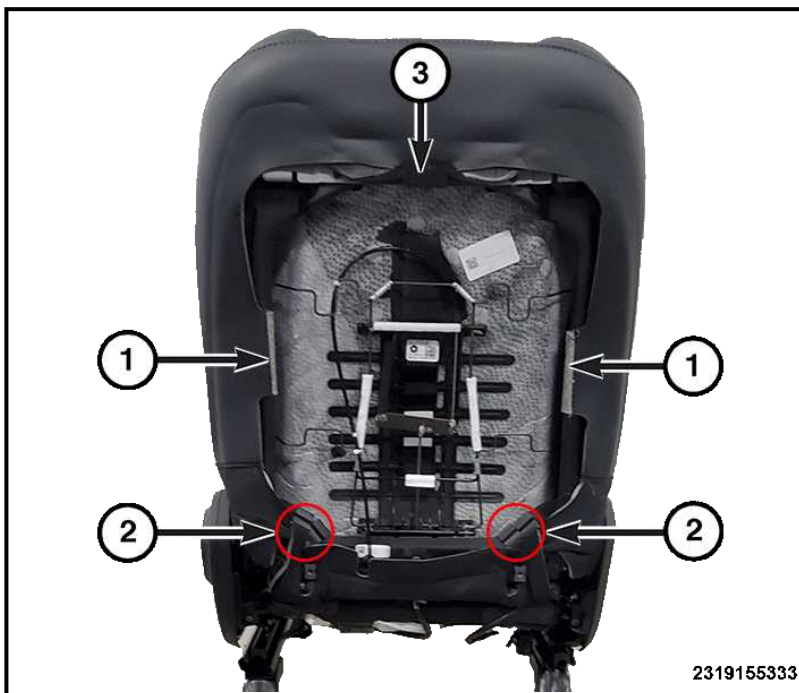
- Position the seat cover on the seat foam and install **NEW** hog rings.

UP LEVEL

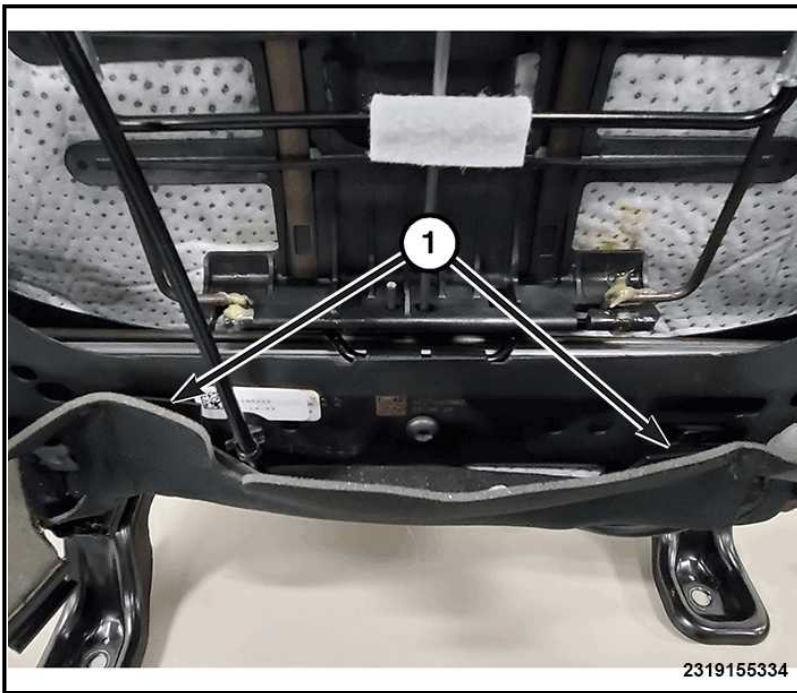
WARNING: Disable the airbag system before attempting any front seat diagnosis or service. Disconnect and isolate the negative battery (ground) cable and wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

REMOVAL

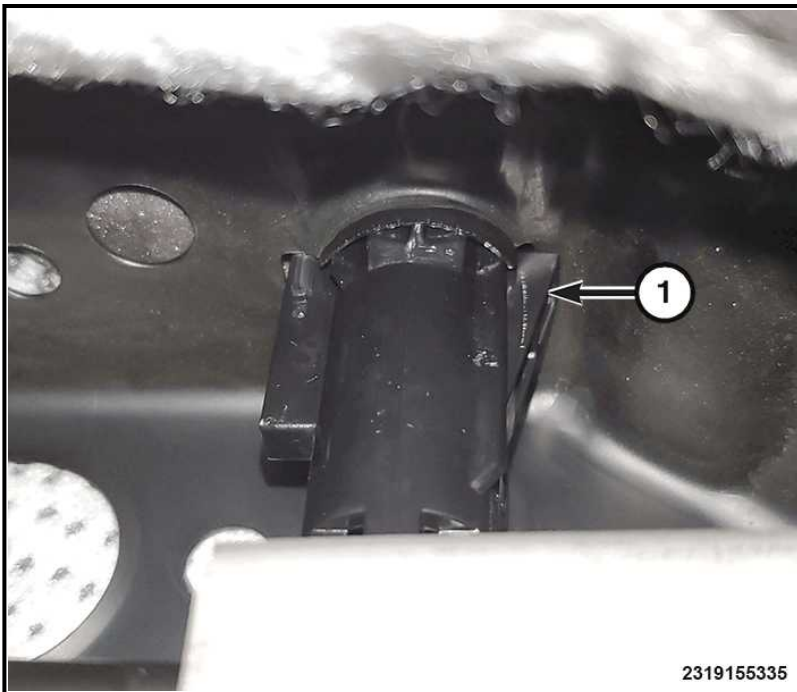
1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING](#).
2. Remove the front seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#).
3. Remove the front seat back. Refer to [SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#).
4. Remove the seat back panel. Refer to [PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
5. Remove the headrest from the seat back.



6. Release the J-hooks (1 and 2) first then release the upper J-hook (3).



7. Unclip the wire harness from the seat frame.

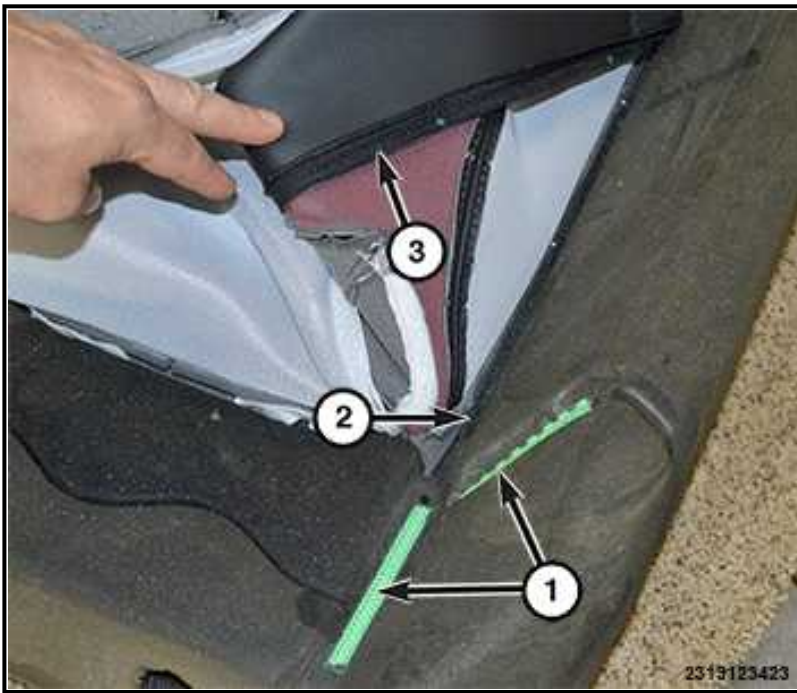


8. Pull the foam back, then using a flat bladed tool, push the tab (1) and pull out the headrest sleeves (2).

9. Remove the seat air bag from the seat back frame, following all warnings and cautions. Refer to [**AIR BAG, SEAT, REMOVAL AND INSTALLATION**](#) .

10. Remove the seat air bag from the chute and set aside.

11. Remove the seat back foam and seat back cover as an assembly, from the seat back frame.



12. Pull the seat back cover (3) away from the seat foam, releasing the hook and loop fasteners (1) first.
13. Cut the hog rings (2) and remove the seat back cover from the foam.

INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING](#).
2. Position the seat cover on the seat foam and install **NEW** hog rings.
3. Pull the seat cover tight and engage the hook and loop fasteners.
4. Position the seat back foam assembly on the seat back frame.
5. Install the seat air bag in the chute and connect the wire harness connector.
6. Install the seat air bag in the seat back frame, following all warnings and cautions. Refer to [AIR BAG, SEAT, REMOVAL AND INSTALLATION](#).
7. Install the headrest sleeves.
8. Route the wire harness and clip it to the seat frame.
9. Fasten the side J-hooks and then the four lower J-hooks.
10. Install the head rest.
11. Install the seat back panel. Refer to [PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
12. Install the front seat back. Refer to [SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#).
13. Install the front seat. Refer to [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

COVER, SEAT CUSHION

REMOVAL AND INSTALLATION

FOUR DOOR SEAT CUSHION COVER

WARNING:

Disable the airbag system before attempting any front seat diagnosis or service. Disconnect and isolate the negative battery (ground) cable and wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

NOTE: The Occupant Classification System (OCS) is used in the passenger side front seat of vehicles manufactured for domestic markets. Vehicles manufactured for export markets use the Occupant Detection Sensor (ODS) instead of the OCS on the passenger side front seat.

NOTE: All of the components of the OCS including the Occupant Classification Module (OCM), the Seat Weight Sensor (SWS), the plastic insulator SWS pad, the passenger seat cushion foam, the passenger seat cushion trim, the electronic pressure sensor, the OCS pressure hose, and the heat mat and vent bag (if equipped), are serviced only as a factory-calibrated and assembled unit. Any time any one of these components requires replacement for any reason, the entire calibrated OCS must be replaced and re-zeroed. Refer to the appropriate diagnostic information.

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING.](#)



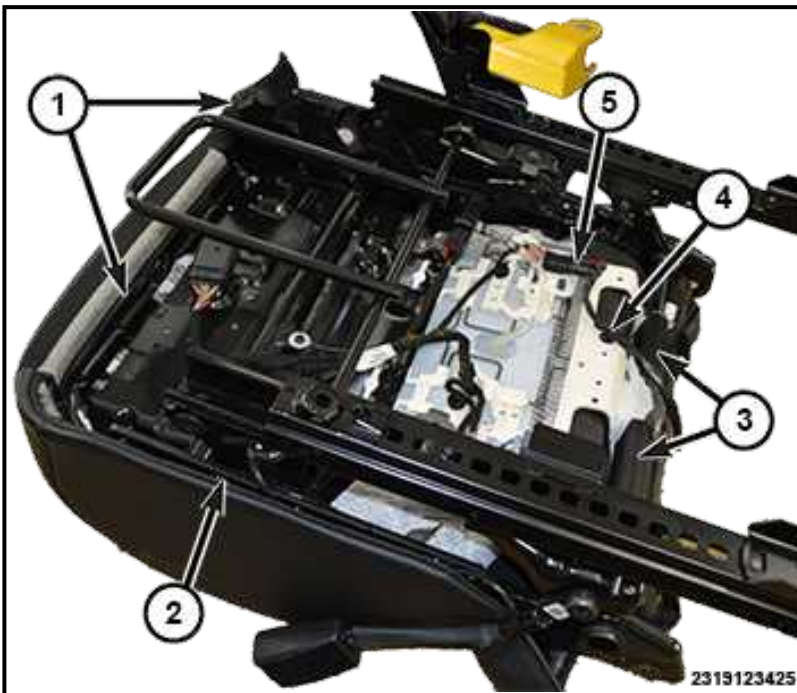
1 - Push Fastener
2 - Cover

2. Unhook the cover on both sides of the seat back and remove the push fastener.



1 - Cover
2 - Screw
3 - Lumbar Knob

3. Using a small flat bladed tool, remove the cover, then remove the screw and the lumbar knob.



1 - Front J-Clips
2 - Seat Cushion Cover Side J-Clips
3 - Rear J-Clips
4 - Wire Harness Connector Retainer
5 - Wire Harness Connector

4. Using a trim tool, release the side J-clips of the seat cushion cover.

5. Unhook the cover J-clips at the front and rear of the cushion.

6. Disconnect the wire harness connector for the seat heater, if equipped, and unclip the wire harness from the seat frame.

7. Remove the seat cushion foam and seat cushion cover as an assembly, from the seat frame.



1 - Hook and Loop Strip

8. Release the hook and loop strip.



1 - Hog Rings
2 - Seat Cover

9. Pull the seat cover away from the seat foam, cut the hog rings and remove the cover.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- For passenger seat equipped with OCS, position the **NEW** seat foam assembly on the seat frame.

- Refer to specific instructions related to OCS installation. Refer to [MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION](#) .
- For a driver seat equipped with a Drivers Presence Protection Module (DPPM), inspect it for damage. If damaged replace the foam assembly.
- For driver seat: Position the seat cover on the seat foam, install new hog rings, fasten the hook and loop strips and position the foam assembly on the seat frame.
- Tighten lumbar knob screw securely.
- If servicing the passenger seat, do not connect the negative battery cable at this time. The Supplemental Restraint System (SRS) Verification Test procedure should be performed following service of any SRS component. Refer to [STANDARD PROCEDURE](#) .
- Following successful completion of the SRS Verification Test procedure, perform the OCM System Verification Test procedure found in the diagnostic scan tool under Miscellaneous Functions. Refer to the appropriate diagnostic procedures.
- If this Electronic Control Unit (ECU) is being replaced with a new unit, a diagnostic scan tool MUST be used to align the PROXI configuration data into the new ECU. Follow the routine outlined in the diagnostic scan tool for PROXI Configuration Alignment under Body Control Module (BCM) Miscellaneous Functions menu.

PANEL, SEAT BACK, FRONT

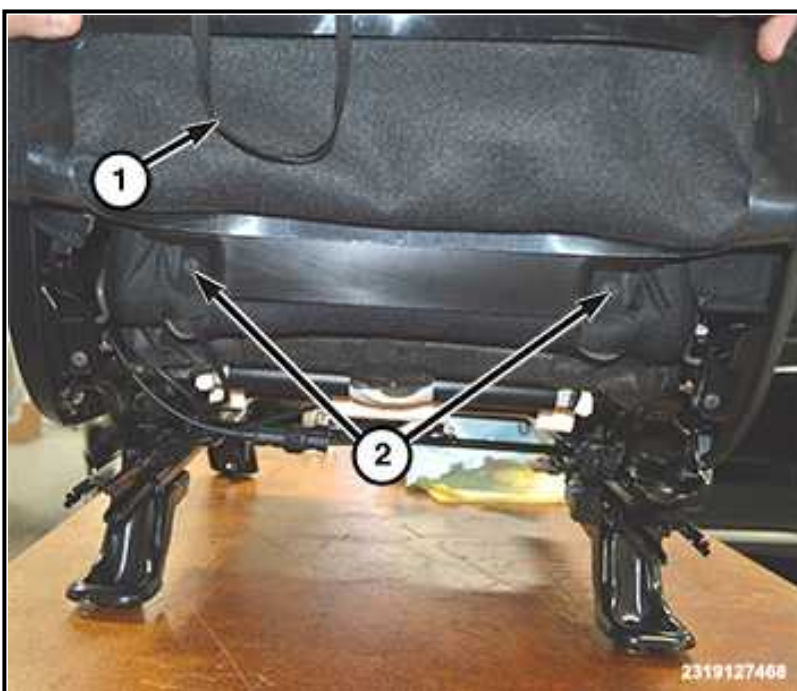
REMOVAL AND INSTALLATION

SEAT BACK PANEL

WARNING: Disable the airbag system before attempting any front seat diagnosis or service. Disconnect and isolate the negative battery (ground) cable and wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING](#).



2 - Screws

2. Unhook the two lower straps from the bottom of the seat, then remove the two screws.



1 - Hooks

2 - Seat Back Panel

3 -

3. Pull downward slightly on the seat back panel, then release the hooks on one side of the panel and remove.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Push up on the seat back panel to fully engage the top hooks, then push to engage the side hooks.
- Install the two screws at the bottom and tighten securely.

SEAT, FRONT

REMOVAL AND INSTALLATION

FRONT SEAT

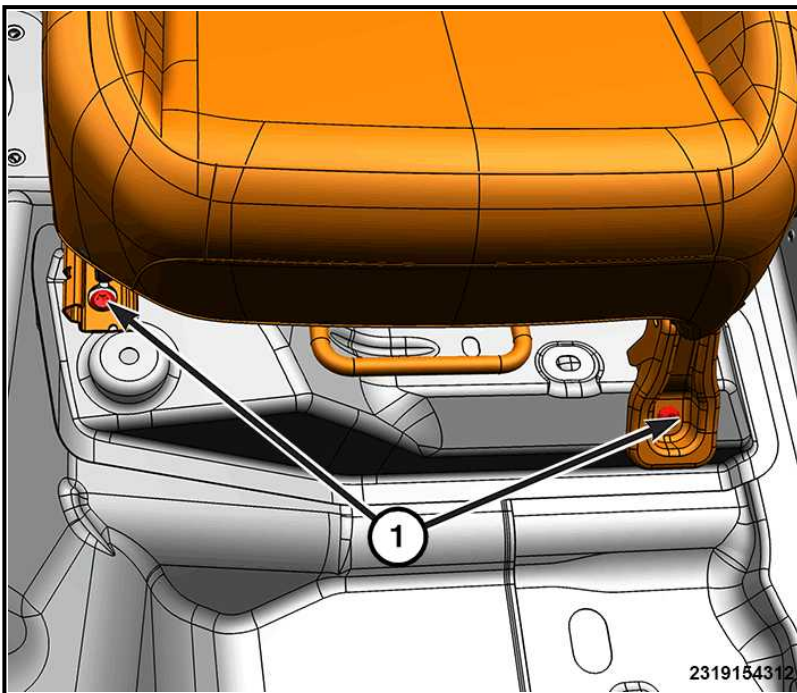
REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to **SEATS, FIRST ROW, WARNING**.
2. Disconnect and isolate the negative battery cable. If equipped with an Intelligent Battery Sensor (IBS), disconnect the IBS connector first before disconnecting the negative battery cable.



1 - Rear Seat Bolts

3. Position the seat in the full forward position, and remove the rear seat bolts.
4. Move the seat to the rearward position.



1 - Front Seat Bolts

5. Remove the front seat bolts.
6. Tilt the seat up and disconnect the wire harness connectors, then remove the seat.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install the front seat bolts loose.

- Move the seat forward and install the rear seat bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- Move seat rearward and tighten the front seat bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
- The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. Refer to [STANDARD PROCEDURE](#) .

SEAT BACK, FRONT

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

WARNING:

Disable the airbag system before attempting any component diagnosis or service of the front seats, when equipped with front seat air bags. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

REMOVAL

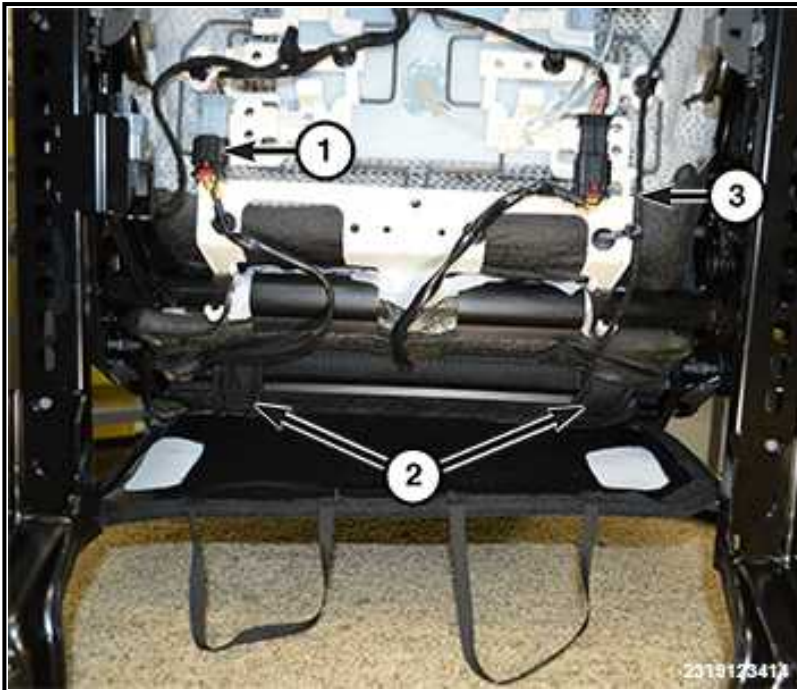
1. Remove the front seat side shields. Refer to [SIDE SHIELDS, SEAT CUSHION, FRONT, REMOVAL AND INSTALLATION](#).



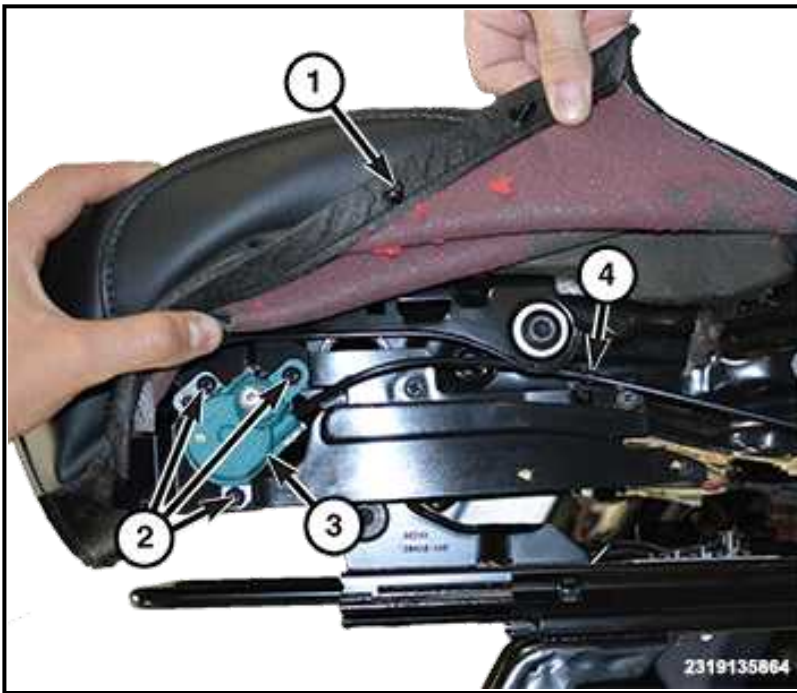
2. Unhook the cover (2) on both sides of the seat back and remove the push fastener (1).



3. Using a small flat bladed tool, remove the cover (1), then remove the screw (2) and the lumbar knob (3), if equipped.



4. Under the seat, open the hook and loop straps (2).
5. Disconnect the seat heater harness connector (1) and unclip the wire harness from the seat frame, if equipped.
6. Unclip the seat air bag wire harness (3) from the seat frame.



7. Using a trim stick, release the push fasteners (1) on the side of the cushion trim.
8. Remove the screws (2) and loosen the lumbar controls (3), then unclip the cable (4) from the seat frame.



9. Remove the bolts (1) on both sides of the seat back (2), and remove the seat back.

INSTALLATION

1. Position the seat back and install the two front seat back bolts on each side of the seat. Tighten the front seat back bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#).
2. Route the lumbar cable and fasten the lumbar controls.
3. Fasten the seat cushion trim to the frame and hook the sides near the seat back pivot.
4. From under the seat, route the seat back heater harness and connect the wire harness connector, if equipped.
5. From under the seat, route the seat air bag wire harness and clip it to the seat frame.
6. Fasten the hook and loop strips.
7. Install the lumbar knob.

8. Install the front seat side shields. Refer to [SIDE SHIELDS, SEAT CUSHION, FRONT, REMOVAL AND INSTALLATION](#).

SIDE SHIELDS, SEAT CUSHION, FRONT

REMOVAL AND INSTALLATION

SEAT CUSHION SIDE SHIELDS

NOTE: The front seat does not need to be removed in order to service only the outer side shield. The seat will need to be removed to continue any additional service on the seat.

WARNING: Disable the airbag system before attempting any component diagnosis or service of the front seats, when equipped with front seat air bags. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

REMOVAL

1. If necessary, remove the front seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#).



1 - Outer Side Shield Cover

2. Remove outer side shield cover fastener.
3. Using a trim tool, remove the outer side shield cover.



1 - Lift Lever
2 - Lift Lever Fasteners
3 - Rear Outboard Side Shield Fastener
4 - Outboard Side Shield
5 - Outboard Side Shield Fastener

4. Remove the two fasteners and the lift lever.
5. Remove the fastener at the back of the outboard side shield.
6. Remove the fastener, then the outboard side shield.



1 - Rear Fasteners
2 - Side Fastener
3 - Inboard Side Shield

7. Remove the fasteners at the rear of the seat and fastener at the side of seat on inboard side shield.
8. Remove the inboard side shield.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- All fasteners are tightened securely.

SLEEVE, HEADREST, FRONT

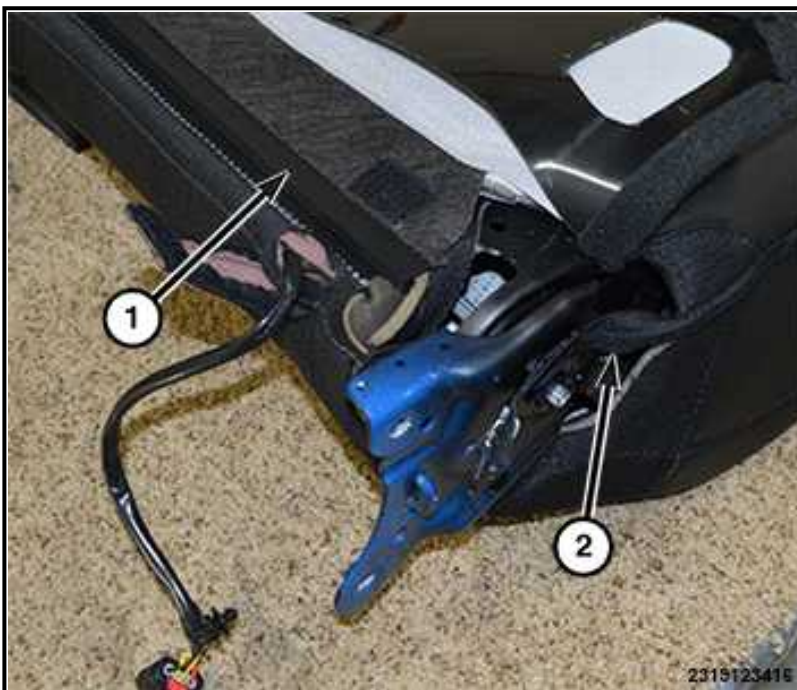
REMOVAL AND INSTALLATION

FOUR DOOR HEADREST SLEEVE

WARNING: Disable the airbag system before attempting any component diagnosis or service of the front seats, when equipped with front seat side air bags. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions may result in accidental airbag deployment and possible serious or fatal injury.

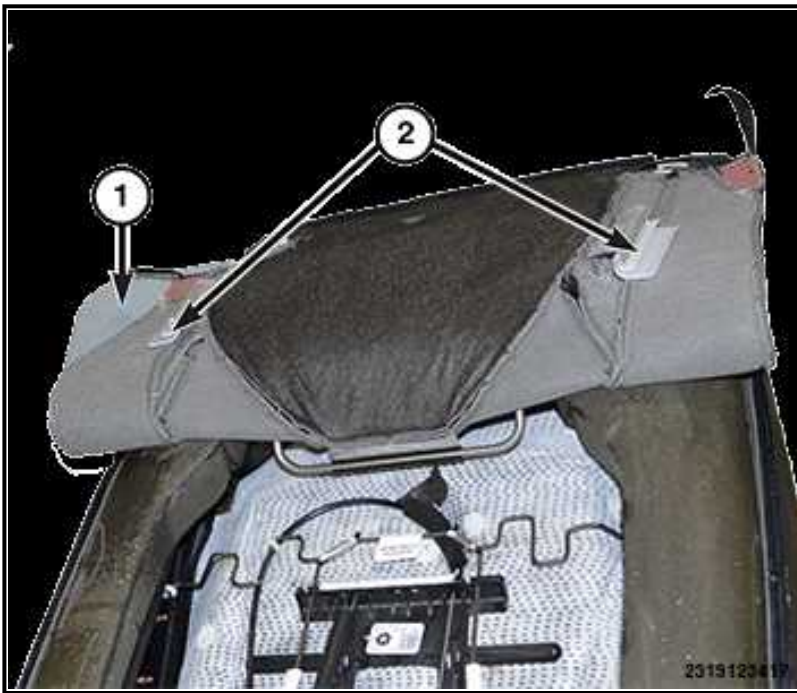
REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING](#).
2. Remove the front seat back. Refer to [SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#).
3. If equipped with uplevel trim remove the seat back panel. Refer to [PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
4. Remove the headrest from the seat back.



1 - J-hook Retainer
2 - Zipper

5. Open the zippers on each side of the seatback cover and release the J-hook strip (1).



1 - Seat Back Trim

2 - Side Retainers

6. Lift the seat back trim slightly and release the side retainers.



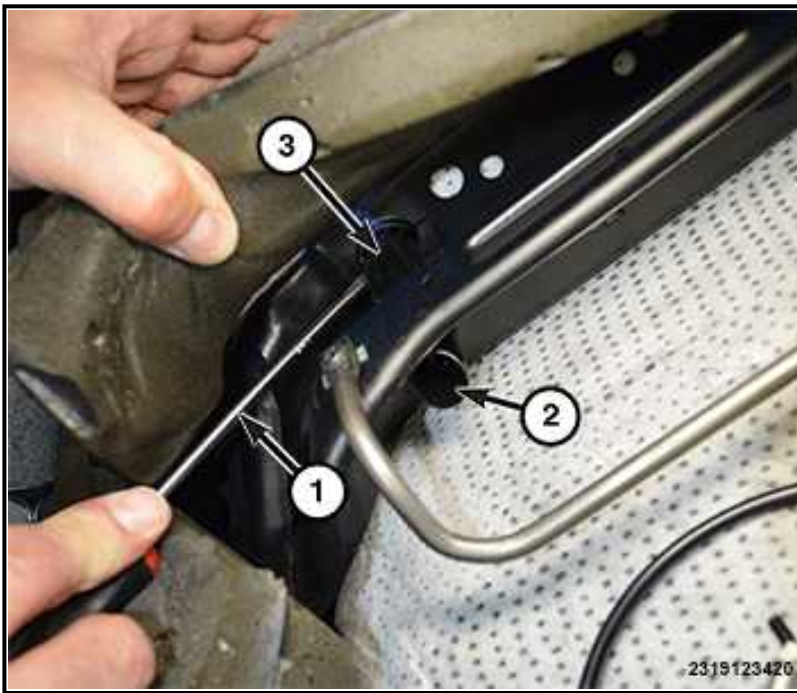
1 - J-hook Retainers

2 - Wire Harness

3 - J-hook Retainer

7. Release the J-hook retainers for the seat back cover.

8. Unclip the wire harness.



1 - Flat Bladed Tool
2 - Headrest Sleeve
3 - Tab

9. Pull the foam back, then using a flat bladed tool, push the tab and pull out the headrest sleeves.

1. INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

SUPPORT, LUMBAR

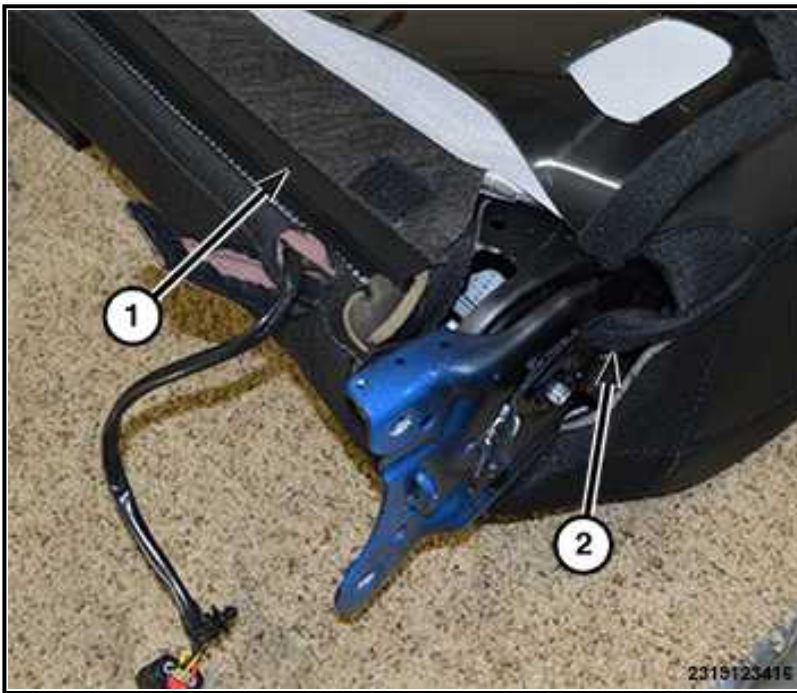
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

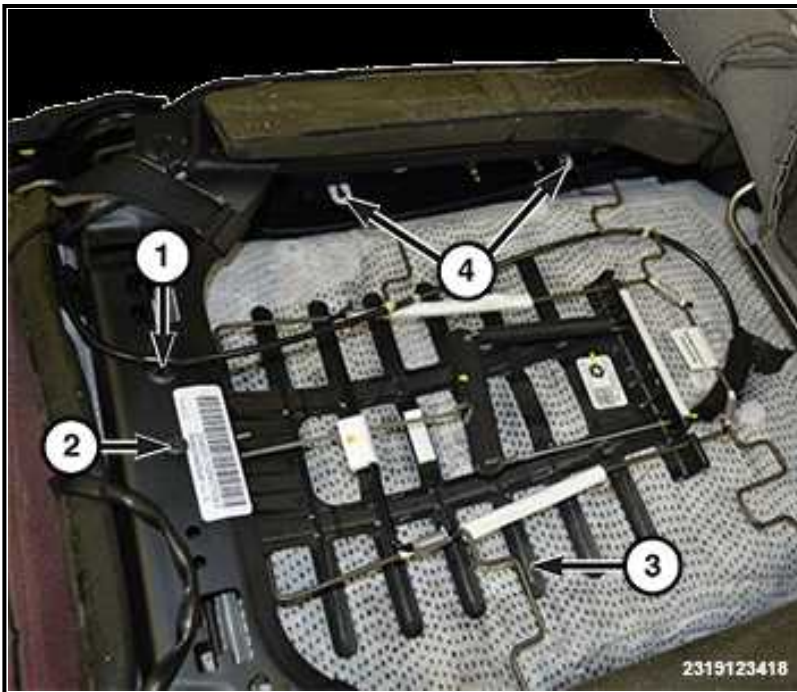
WARNING: Disable the airbag system before attempting any component diagnosis or service of the front seats, when equipped with front seat air bags. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. Refer to [SEATS, FIRST ROW, WARNING](#).
2. Remove the seat from the vehicle. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).
3. If equipped with uplevel trim remove the seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#) [PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
4. Remove the front seat back. Refer to [SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#).



5. With base trim open the zippers (2) on each side of the seatback cover and release the J-hook strip (1).



6. Lift the seat back trim and unclip the cable (1).

7. Remove the screw (2).

8. Unhook the lumbar support ends (4) and remove the lumbar support (3).

INSTALLATION

1. Install the lumbar support and install the retainer screw.

2. Route the cable and clip it to the seat back frame.

3. Fasten the seat back cover J-hook retainers.

4. with base trim close the side zippers and fasten the lower J-hook retainers.

5. Install the front seat back. Refer to [SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#).

6. With uplevel trim install the seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#)[PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).

SEATS, SECOND ROW

ARMREST, SECOND ROW

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Fold the 40% seat forward in the flat position.
2. Using a trim tool, remove the armrest pivot cover (1).



3. Remove the screw (2) and the plastic guide (1).
4. Using a small flat bladed tool, remove the retainer (3).



5. Unhook the armrest pivot (2) from the slot, then push inward and rotate the armrest (3) to remove.
6. Remove the inner armrest trim, if necessary.

INSTALLATION

1. Install the inner armrest trim to the armrest bracket, if necessary.
2. Position the armrest to the seat opening and to the armrest pivot.
3. Push inward while rotating the armrest and hook the armrest pivot to the slot.
4. Install the retainer.
5. Position the plastic guide and install the screw securely.
6. Install the armrest pivot cover.

CABLE, RELEASE, FOLD FLAT, SPLIT SEAT

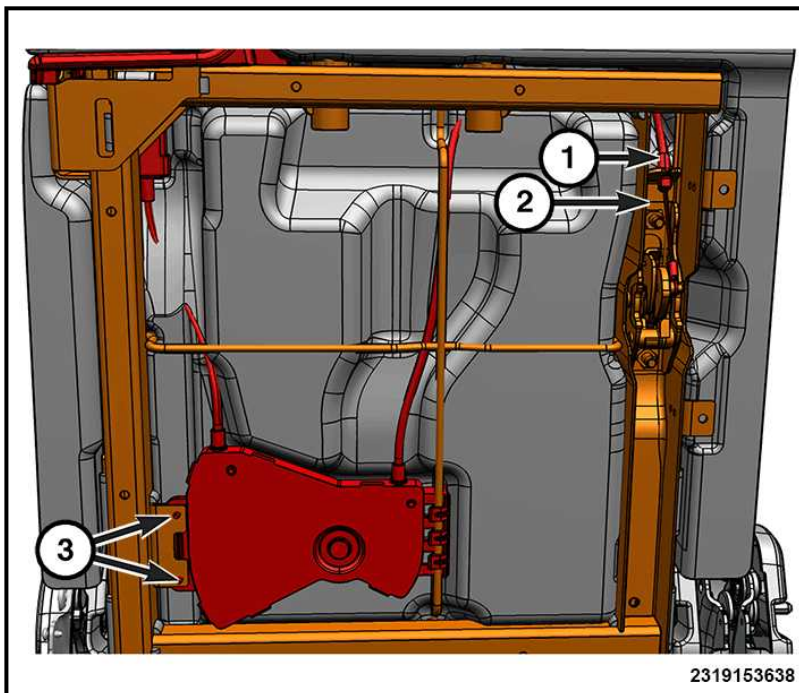
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

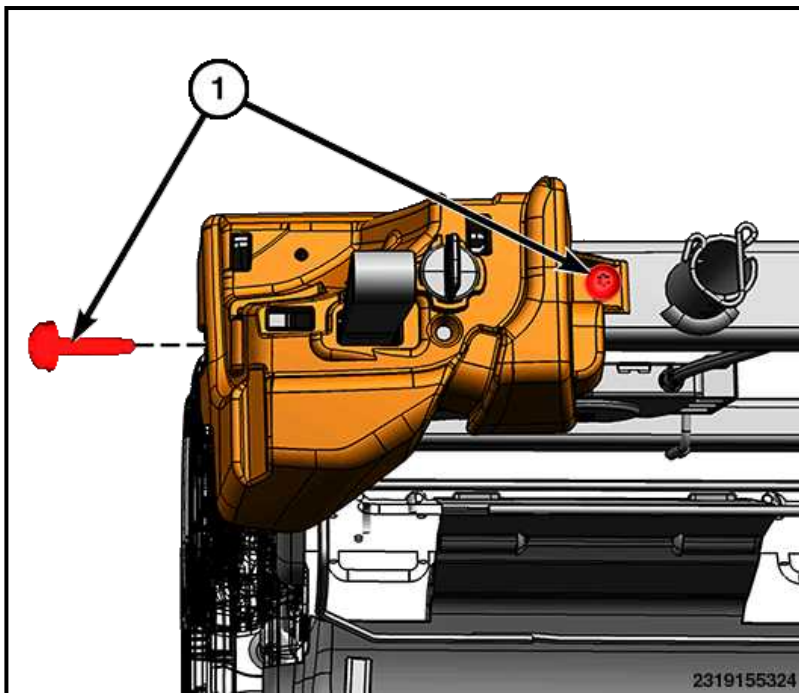
NOTE: The 40% split seat configuration procedure as shown in illustration, 60% split seat configuration similar.

REMOVAL

1. Remove the seat back foam and seat back cover as an assembly, from the seat back frame. Refer to COVER, SEAT BACK, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION.
2. Remove the seat back panel. Refer to PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATIONPANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION.



3. Remove the cable (1) from the seat frame (2).
4. Remove the cable end and the screws (3) from the seat back release system.



5. Remove the screws (1) securing the release handle to the seat frame.

INSTALLATION

1. Install the release handle to seat frame and install the screws. Tighten the screws securely.
2. Install the seat back release system to the seat frame with the screws. Tighten the screws securely.
3. Route the cable and install the cable ends to the latch.
4. Clip the cable to the seat frame.
5. Verify the function of the release cable.
6. Install the seat back cover. Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATION](#)[COVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATION](#)[COVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#).

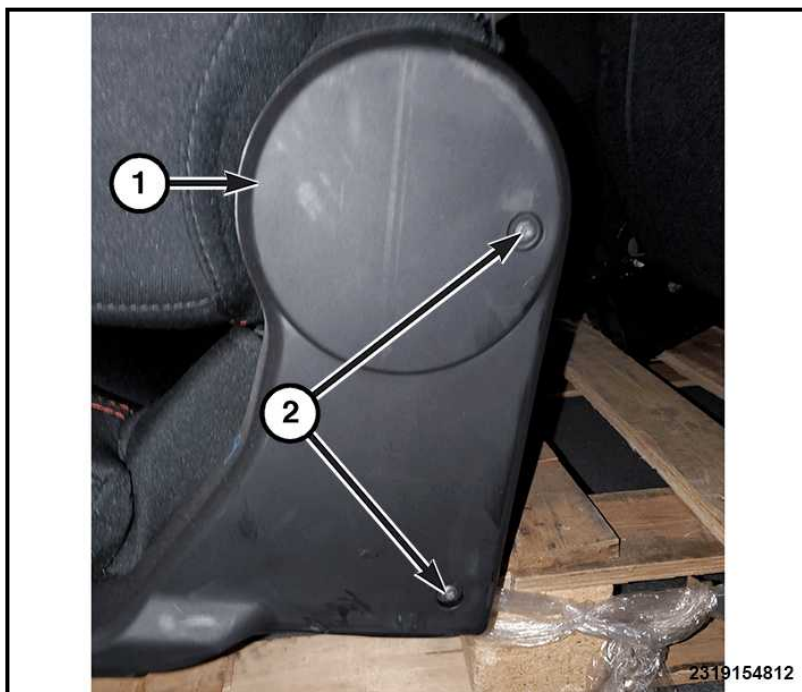
COVER, SEAT BACK SECOND ROW 40%

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

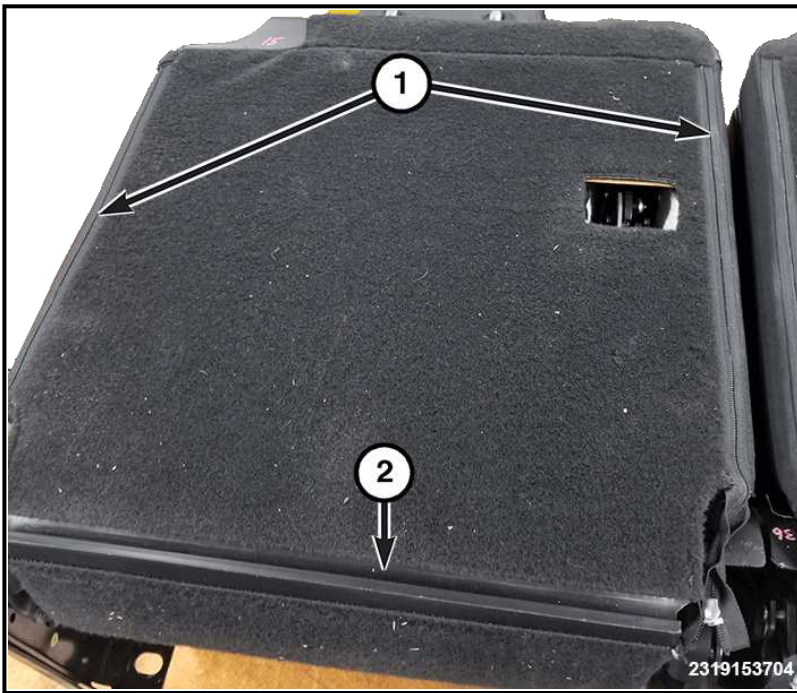
1. Remove the 40% rear seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).



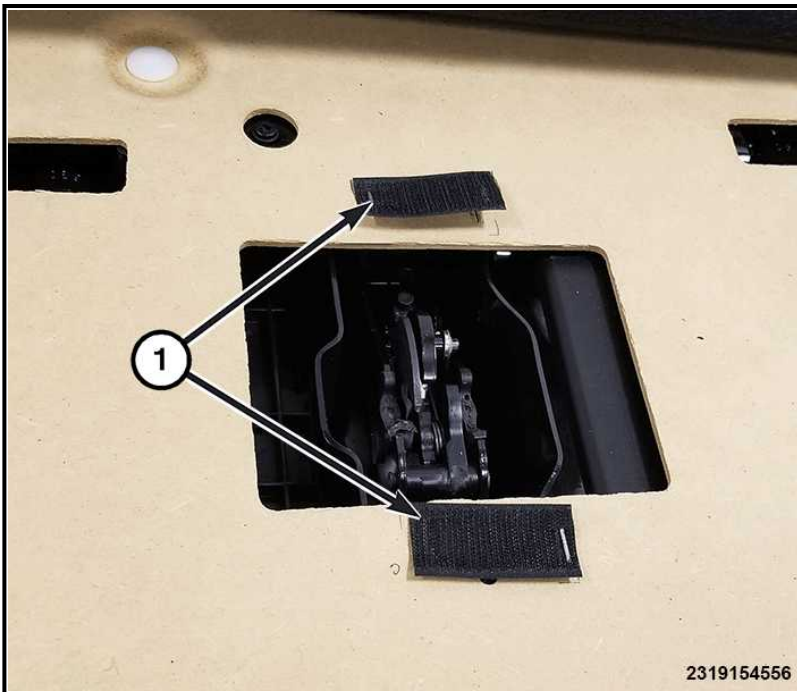
2. Remove the two seat pivot cover screws (2), and remove the pivot cover (1).



3. Remove the seat pivot bolts (1).
4. Remove the seat back from the seat cushion.

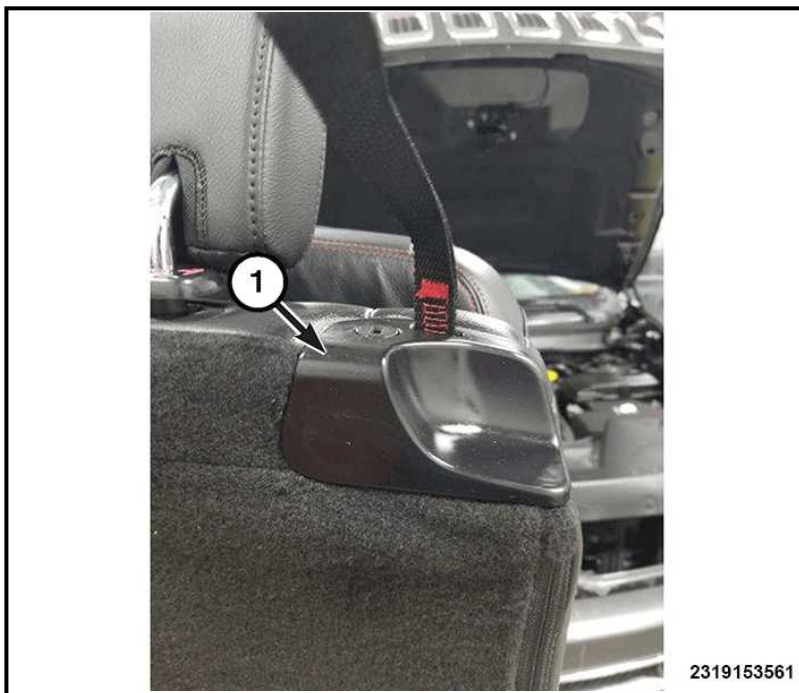


5. Release the J-hook (2) and open the zippers (1).

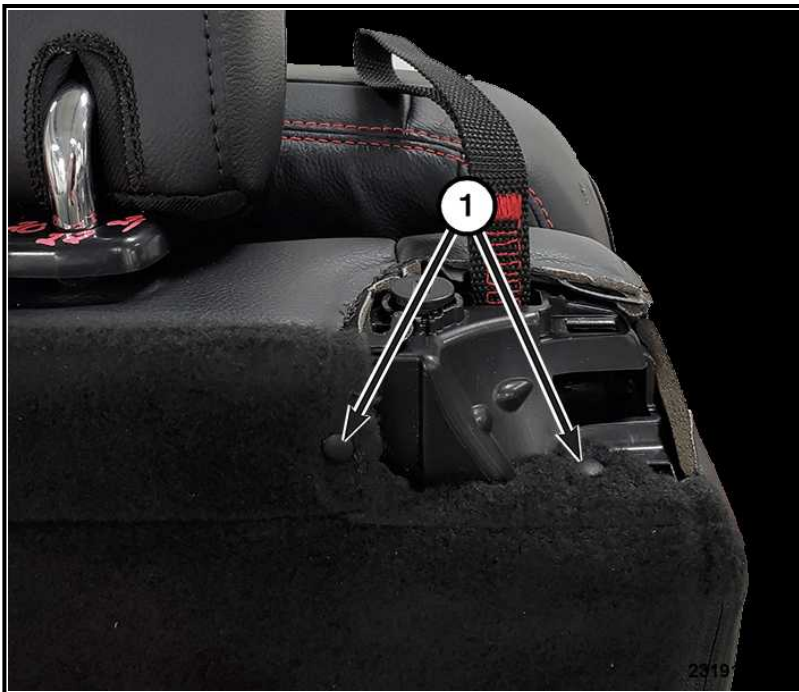


6. Lift the rear of the seat cover and release the hook and loop pads (1) by the seat latch.

7. Remove the seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#)[PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).



8. Using a trim stick, remove the seat release strap bezel cover (1).



9. Remove the push clips (1) for the seat cover, located under the bezel.

10. Remove the headrest. Refer to [HEADREST, SECOND ROW, REMOVAL AND INSTALLATION](#).



11. Remove the seat back foam and seat back cover as an assembly from the seat back frame.
12. Pull the hook and loop strip (1), on seat cover, apart from the seat foam and cut the front hog rings.
13. Pull the seat back cover away from the seat foam and cut the rear cover hog rings and remove the cover.

INSTALLATION

1. Position the seat back cover to the seat back foam.
2. Pull the seat cover tight to the foam and install **NEW** hog rings.
3. Position the seat back cover and foam assembly to the seat back frame.
4. Install the headrest and headrest tubes. Refer to [HEADREST, SECOND ROW, REMOVAL AND INSTALLATION](#).
5. Install the seat back panel to the seat frame. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#)[PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
6. Close the J-hook and close the zippers.
7. Install the push clips for the seat cover, located under the release strap bezel.
8. Install the release strap bezel.
9. Install the seat back to the seat cushion and install the seat pivot bolts.
10. Tighten the seat pivot bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
11. Install the seat pivot cover and screws.
12. Install the 40% rear seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#)[SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

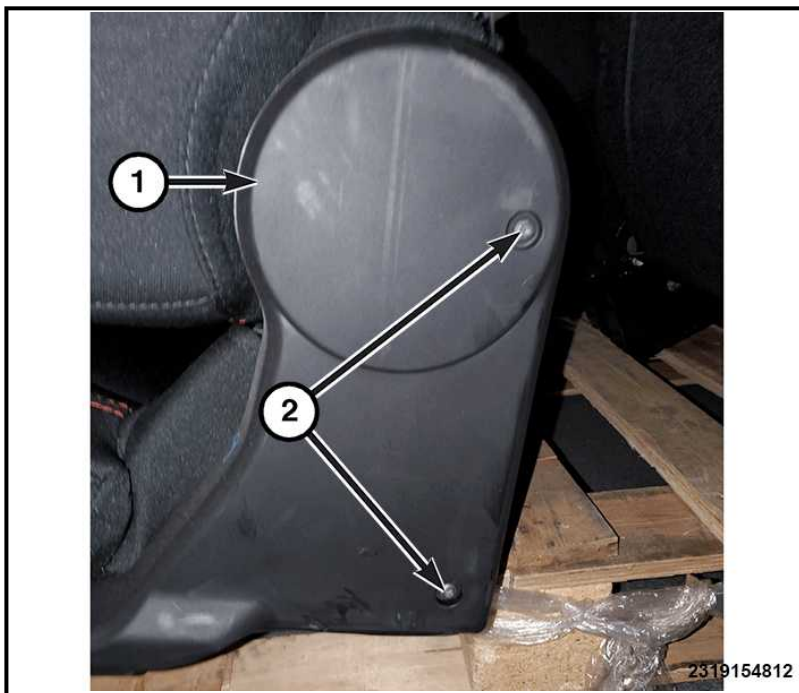
COVER, SEAT BACK SECOND ROW 60%

REMOVAL AND INSTALLATION

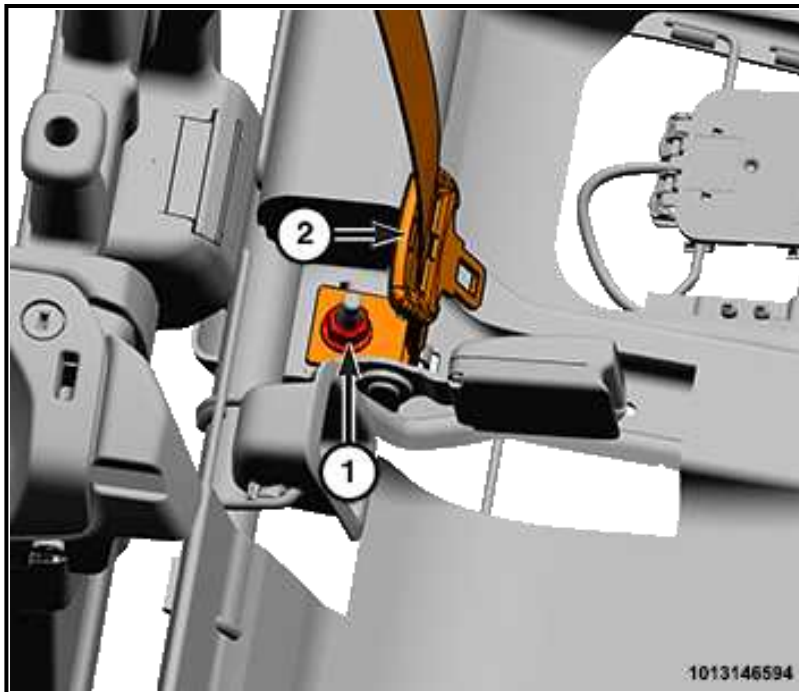
REMOVAL AND INSTALLATION

REMOVAL

1. Remove the 60% rear seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#)[SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).



2. Remove the two seat pivot cover screws (2) and remove the pivot cover (1).



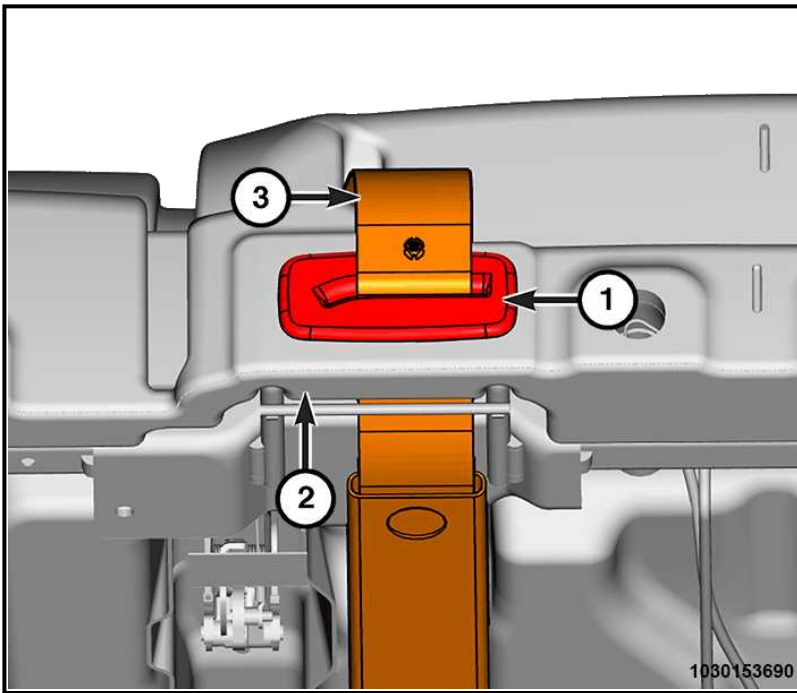
3. Remove the center seat belt retractor nut (1) from lower seat frame.



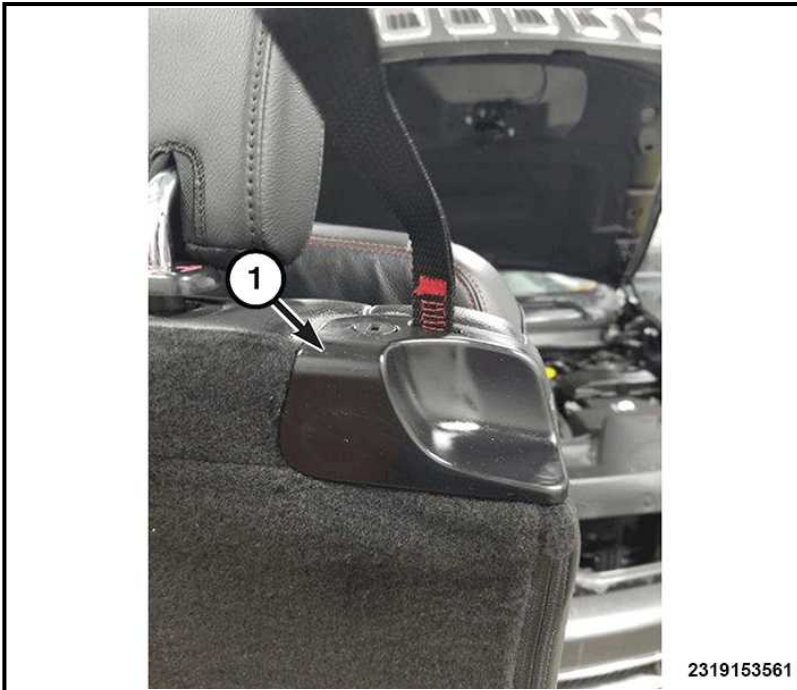
4. Remove the seat pivot bolts (1).
5. Remove the seat back from the seat cushion.
6. If equipped, remove the armrest. Refer to [ARMREST, SECOND ROW, REMOVAL AND INSTALLATION](#).



7. Open the zippers (1) on each side of the seat back cover and release the J-hook strip (2).



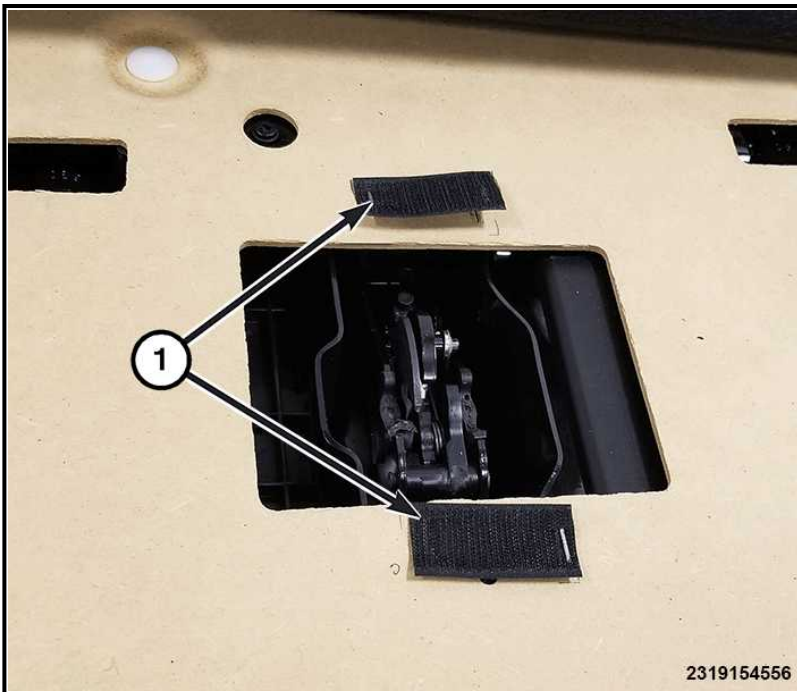
8. Disengage the seat belt guide (1) at the top of the seat back (2) and remove from the seat belt (3) through the slit in the seat belt guide.



9. Using a trim stick, remove the seat release strap bezel cover (1).



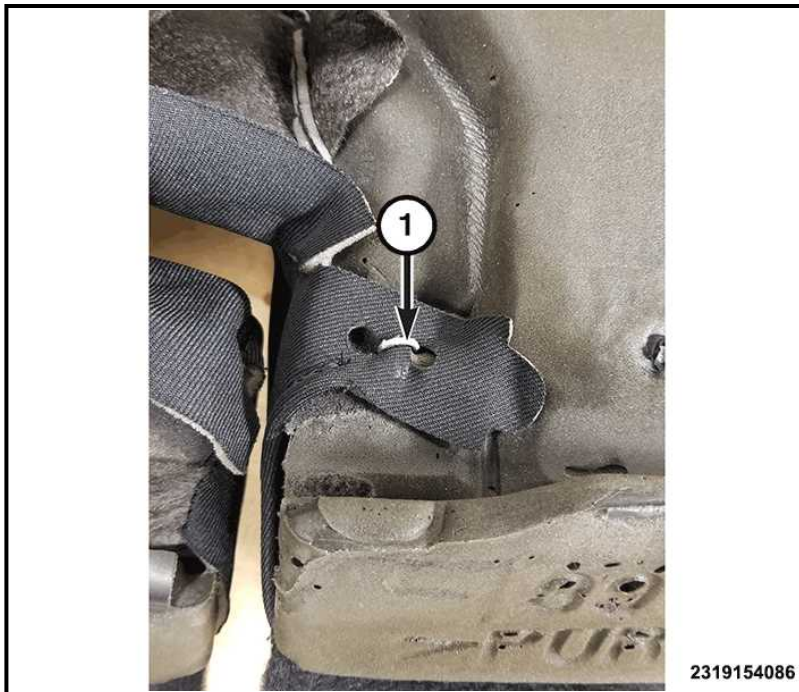
10. Remove the push clips (1) for the seat cover, located under the bezel.



11. Lift the rear of the seat cover and release the hook and loop pads (1) by the seat latch.
12. Remove the seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#)[PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
13. Remove the headrests and the headrest tubes. Refer to [HEADREST, SECOND ROW, REMOVAL AND INSTALLATION](#).

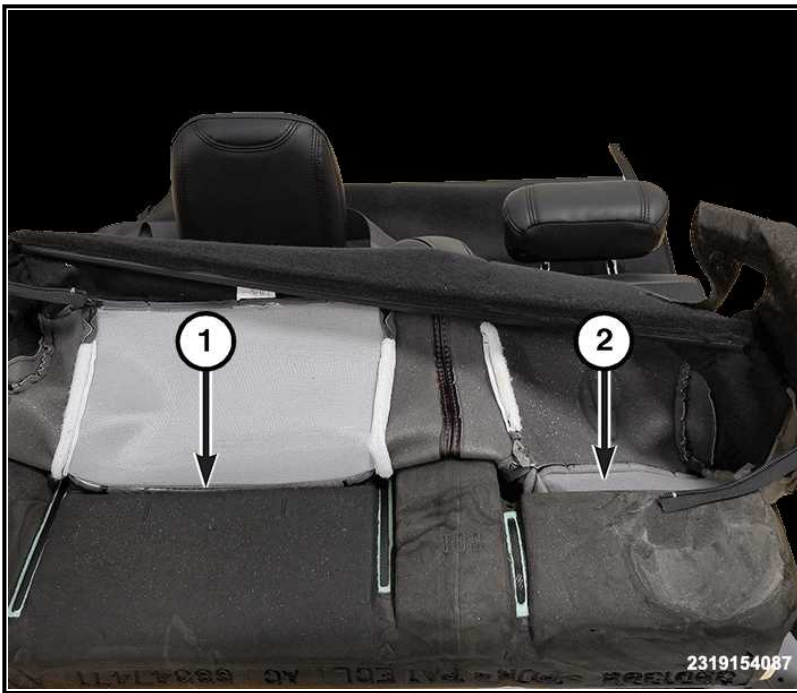


14. Lift the seat back cover, and release the J-hook straps and release the hook and loop strap (1).



15. Cut the hog ring (1) holding the seat back cover to the seat back foam.

16. Remove the seat back foam and seat back cover as an assembly from the seat back frame.



17. Pull the seat back cover away from the seat foam and cut the hog rings (1).
18. Remove the push clips (2).
19. Release the seat cover from the hook and loop strip and pull the seat back cover away from the seat foam.

INSTALLATION

1. Position the seat back cover to the seat back foam.
2. Pull the seat cover tight and install **NEW** hog rings.
3. Install the push clips.
4. Position the seat back foam assembly to the seat back frame.
5. Install NEW hog ring on the rear cover and close hook and loop strap to frame.
6. Install the seat back panel. Refer to **PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION****PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION.**
7. Pull the cover tight and close the J-hook straps.
8. Close the rear seat cover J-hooks and zippers.
9. Install the seat cover push clips under the bezel.
10. Install the seat strap release bezel.
11. Install the seat belt guide.
12. If equipped, install the armrest. Refer to **ARMREST, SECOND ROW, REMOVAL AND INSTALLATION.**
13. Install the headrest and headrest tubes. Refer to **HEADREST, SECOND ROW, REMOVAL AND INSTALLATION.**
14. Install the seat to the seat cushion and install the pivot bolts.
15. Tighten the seat pivot bolts to the proper. Refer to **TORQUE SPECIFICATIONS .**
16. Install the center row seat belt retractor nut and tighten to the proper. Refer to **TORQUE SPECIFICATIONS .**
17. Install the seat pivot cover, and the screws.
18. Install the 60% rear seat. Refer to **SEAT, FRONT, REMOVAL AND INSTALLATION****SEAT, SECOND ROW, REMOVAL AND INSTALLATION.**

COVER, REAR SEAT CUSHION, 40%

REMOVAL AND INSTALLATION

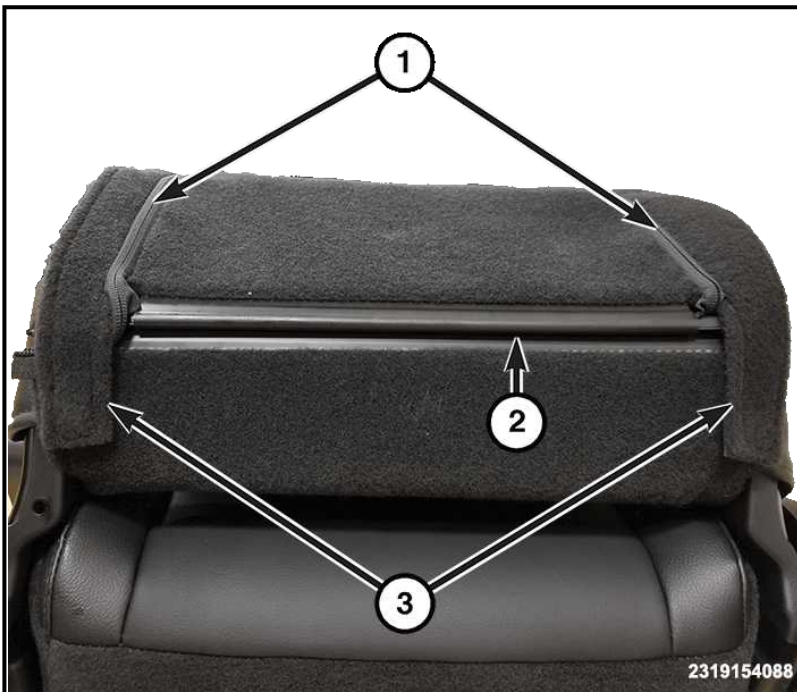
REMOVAL AND INSTALLATION

NOTE: The seat cushion and cover can be removed in vehicle.



REMOVAL

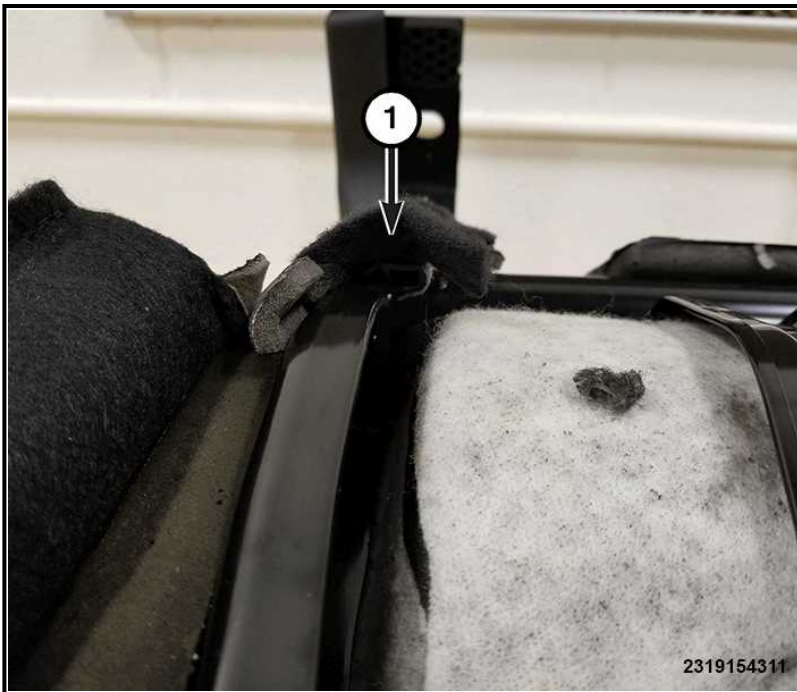
1. Fold the seat cushion down.
2. Using a trim tool, remove the seat tether bezels (1).
3. Lift the seat cushion to the up position.



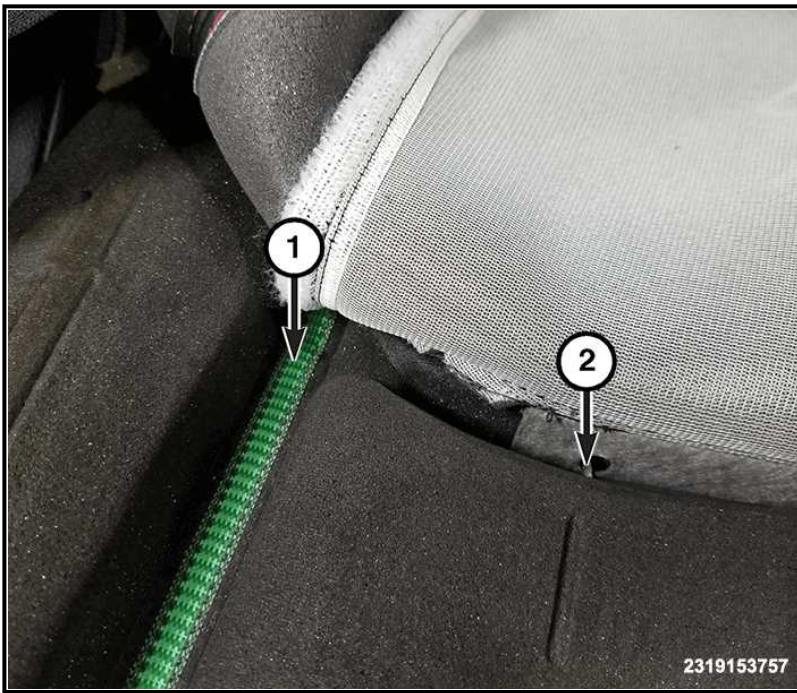
4. Lift up on the rear flaps (3).
5. Release the J-hook (2) then open the zippers (1).



6. Open the rear of the cover and release the J-hook straps (1).



- 7. Remove the J-hook (1) on the outboard seat cover.
- 8. Remove the seat cover and foam from the seat frame.



9. Pull the seat cover away from the foam and release the hook and loop strip (1).
10. Cut the hog rings (2).



11. Release the hook and loop strap (1) at rear of cover and remove from the seat foam.

INSTALLATION

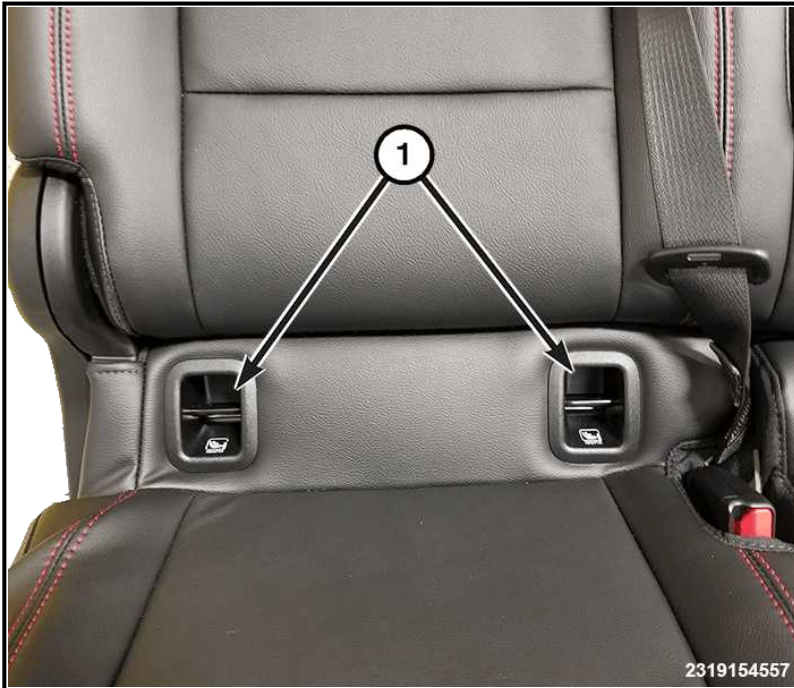
1. Position the cushion cover to the cushion foam and close the hook and loop strap at rear of cover.
2. Pull seat cover tight and install **NEW** hog rings.
3. Position the seat foam assembly to the seat frame.
4. Pull the seat cover down over foam and clip J-hook straps.
5. Fasten the outside seat cover J-hook.
6. Close the zippers and fasten the J-hooks.
7. Close the rear flaps.
8. Lower the seat bottom and install seat tether bezels.

COVER, REAR SEAT CUSHION, 60%

REMOVAL AND INSTALLATION

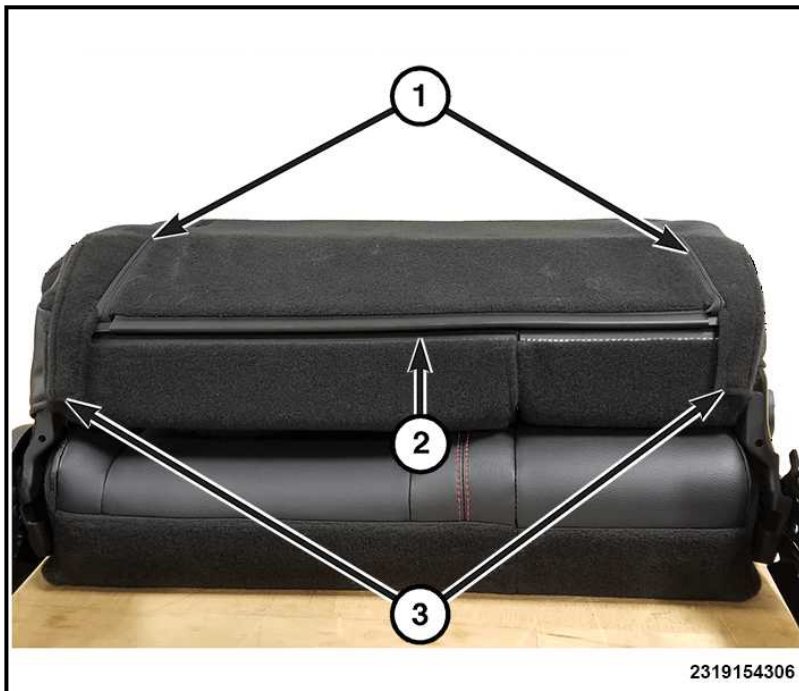
REMOVAL AND INSTALLATION

NOTE: The seat cushion and cover can be removed in the vehicle.

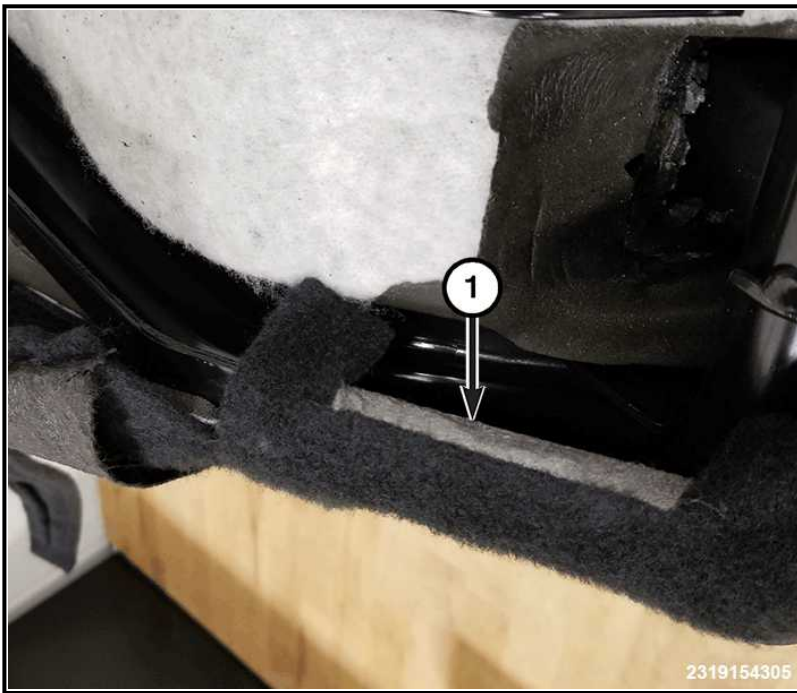


REMOVAL

1. Lower the seat cushion.
2. Using a trim tool, remove the seat tether bezels (1).



3. Raise the lower seat cushion and release the lower seat cover flaps (3).
4. Release the J-hook (2) and open the zippers (1).
5. Lift the rear cover and release the J-hook straps.



6. Release the outside J-hook (1) and fold the cover up from the sides.
7. Remove the seat cover and cushion from the frame.



8. Cut the hog rings (2) and release the hook and loop strip (1).



9. Remove the rear seat cover J-hook (1) strap and remove the seat cover from the seat foam.

INSTALLATION

1. Position the seat cushion cover to the seat cushion foam and install **NEW** hog rings.
2. Install the rear J-hook strap at the rear of the cushion cover under the foam.
3. Position the seat cover and seat foam assembly to the seat frame and reinstall the J-hook at the outside of the cover.
4. Pull the seat cover over the sides of the seat foam and clip the seat cover J-hook straps.
5. Close the zippers and fasten the J-clips retainers at the bottom of the seat cushion.
6. Lower the rear seat cushion.

MECHANISM, FOLDING

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

For more information about the seat folding mechanism. Refer to **FRAME, SEAT CUSHION REAR, REMOVAL AND INSTALLATION**.

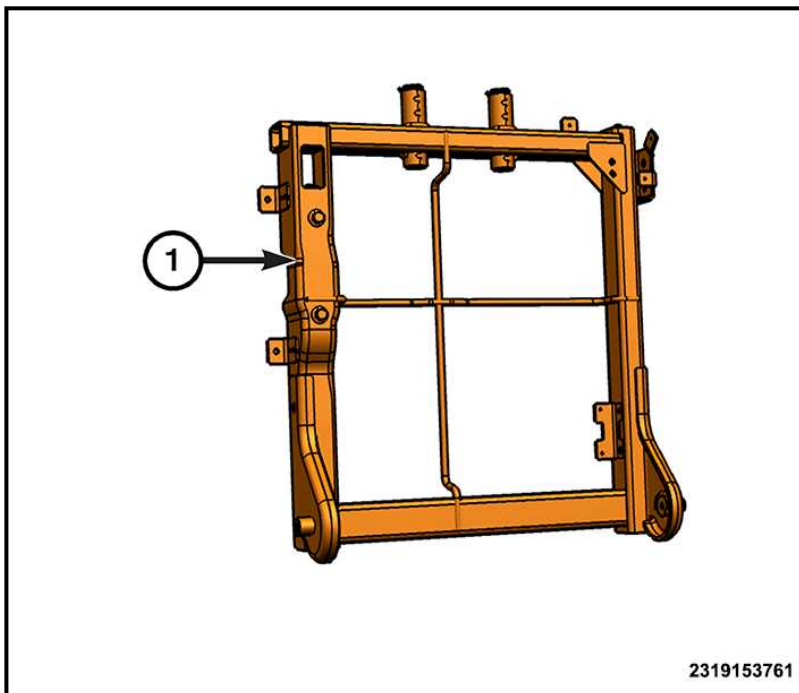
FRAME, SEAT BACK, REAR

REMOVAL AND INSTALLATION

40% SPLIT SEAT

REMOVAL

1. Remove the second row seat. Refer to **SEAT, SECOND ROW, REMOVAL AND INSTALLATION**.
2. Remove the seat back cover. Refer to **COVER, SEAT BACK, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION**.
3. Remove the rear seat back panel. Refer to **PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATIONPANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION**.
4. Remove the seat release cable. Refer to **CABLE, RELEASE, FOLD FLAT, SPLIT SEAT, REMOVAL AND INSTALLATION**.



5. If necessary, remove the seat pivot inner trim from the seat back frame (1).

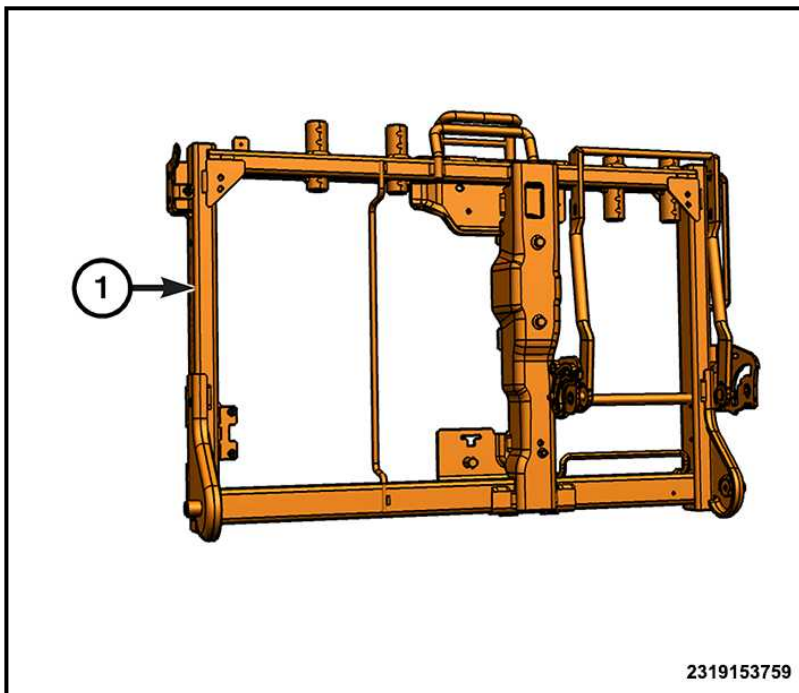
INSTALLATION

1. If necessary, install the seat frame pivot inner trim.
2. Install the seat release cable. Refer to [CABLE, RELEASE, FOLD FLAT, SPLIT SEAT, REMOVAL AND INSTALLATION](#).
3. Install the seat back cover. Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#).
4. Install the rear seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATIONPANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
5. Position the seat back frame and install the second row seat pivot bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#).
6. Install the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATIONSEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

60% SPLIT SEAT

REMOVAL

1. Remove the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATIONSEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).
2. Remove the seat back cover. Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#).
3. Remove the center second row seat belt retractor. Refer to [RETRACTOR, SEAT BELT, REMOVAL AND INSTALLATION](#).
4. Remove the rear seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATIONPANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
5. Remove the seat release cable. Refer to [CABLE, RELEASE, FOLD FLAT, SPLIT SEAT, REMOVAL AND INSTALLATION](#).



6. If necessary, remove the seat pivot inner trim from the seat back frame (1).

INSTALLATION

1. If necessary, install the seat pivot inner trim to the seat back.
2. Install the release cable. Refer to [CABLE, RELEASE, FOLD FLAT, SPLIT SEAT, REMOVAL AND INSTALLATION](#).
3. Install the center second row seat belt retractor. Refer to [RETRACTOR, SEAT BELT, REMOVAL AND INSTALLATION](#).
4. Install the seat back cover. Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATION](#)[COVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATION](#)[COVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#).
5. Install the seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#)[PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).
6. Position the seat back frame to the lower seat frame cushion, and install the second row seat pivot bolts.
7. Tighten the second row seat pivot bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#).
8. Install the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#)[SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

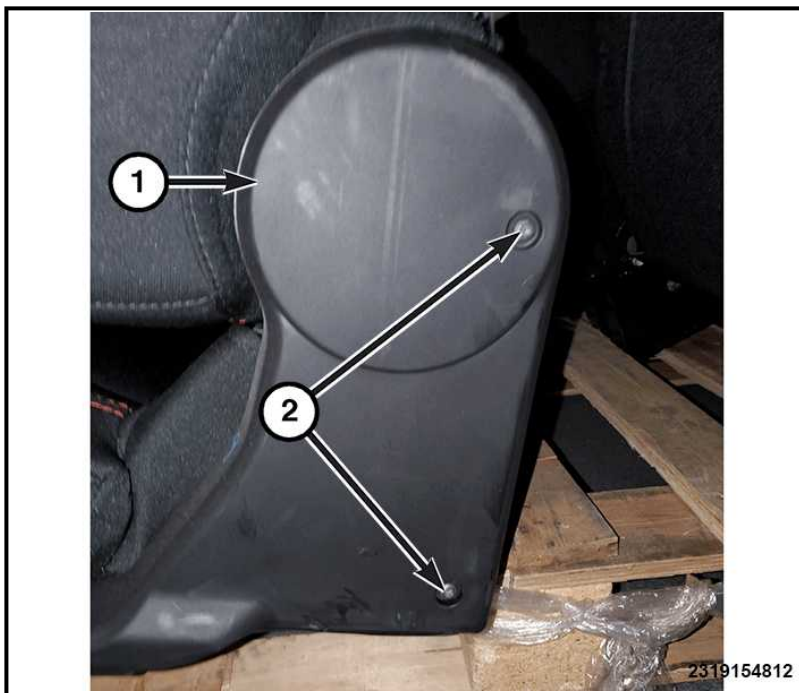
FRAME, SEAT CUSHION REAR

REMOVAL AND INSTALLATION

40% SPLIT SEAT

REMOVAL

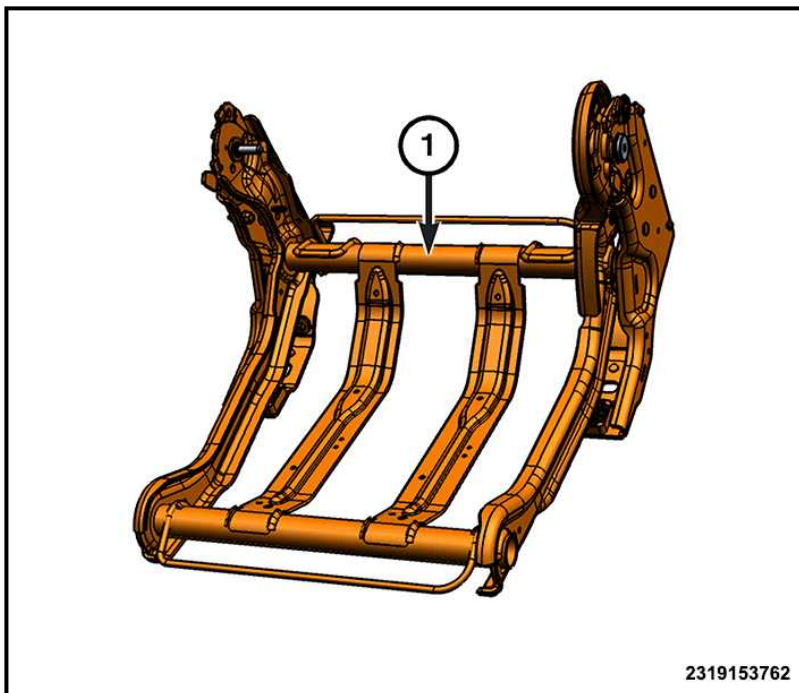
1. Remove the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#)[SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).



2. Remove the two seat pivot cover screws (2) and remove the pivot cover (1).



3. Remove the seat pivot side bolts (1).
4. Remove the seat back from the lower seat cushion.
5. Remove the lower seat cushion cover and foam from the seat frame. Refer to [COVER, SEAT CUSHION, REMOVAL AND INSTALLATION](#)[COVER, REAR SEAT CUSHION, 40%, REMOVAL AND INSTALLATION](#)[COVER, REAR SEAT CUSHION, 60%, REMOVAL AND INSTALLATION](#).



6. If necessary, remove the inner seat pivot trim from the seat frame (1).
7. Remove the seat belt buckle. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .

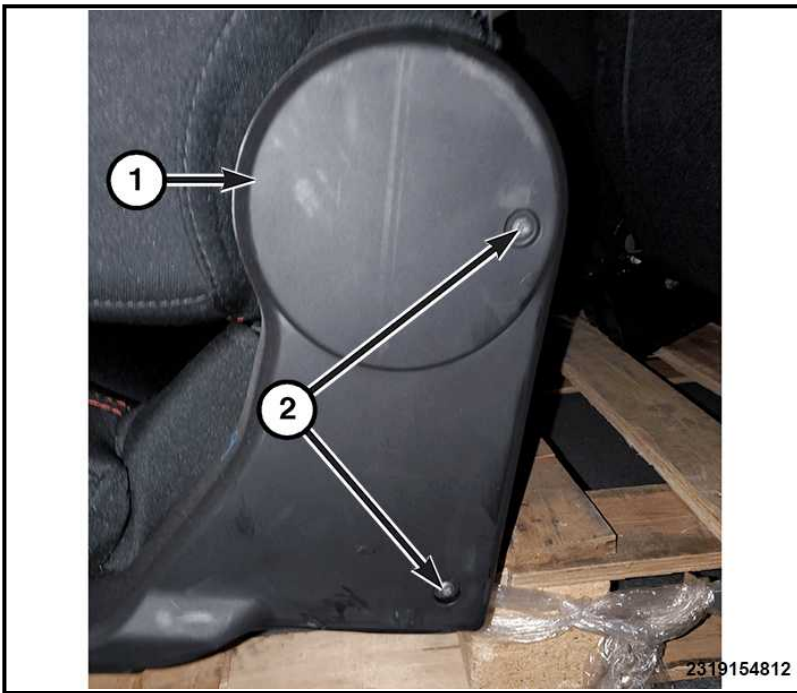
INSTALLATION

1. If necessary, install the inner seat pivot trim to the seat frame.
2. Install the seat belt buckle to the seat frame. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .
3. Install the seat cover and foam assembly to the seat frame. Refer to [COVER, SEAT CUSHION, REMOVAL AND INSTALLATIONCOVER, REAR SEAT CUSHION, 40%, REMOVAL AND INSTALLATIONCOVER, REAR SEAT CUSHION, 60%, REMOVAL AND INSTALLATION](#).
4. Position the seat cushion and frame assembly to the seat back frame and cushion assembly.
5. Install the second row seat pivot bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
6. Install the outer seat pivot covers and tighten the screws.
7. Install the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATIONSEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

60% SPLIT SEAT

REMOVAL

1. Remove the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATIONSEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).



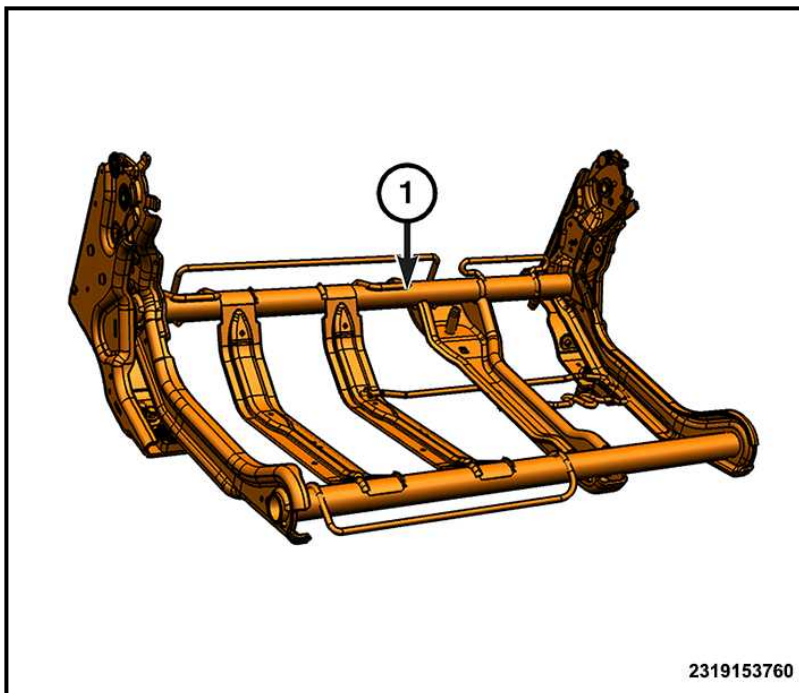
2. Remove the two seat pivot cover screws (2) and remove the pivot cover (1).



3. Remove the seat pivot bolts (1).

4. Remove the seat back frame from the cushion frame.

5. Remove the seat cushion foam and seat cushion cover as an assembly from the seat frame. Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATION](#)[COVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATION](#)[COVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#).



6. If necessary, remove the inner seat pivot trim from the seat cushion frame (1).
7. Remove the seat belt buckle. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .

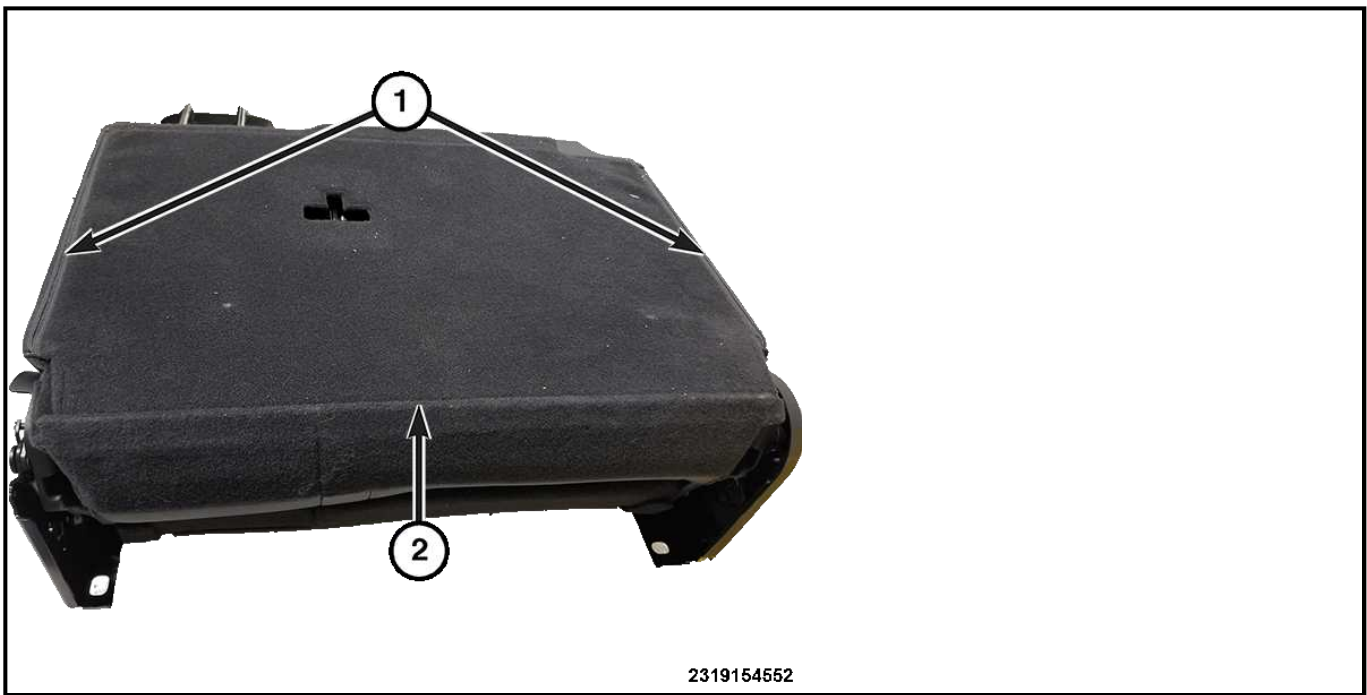
INSTALLATION

1. Install the seat belt buckle to the seat frame. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .
2. If necessary, install the inner seat pivot trim to the seat cushion frame.
3. Install the seat cushion cover and seat foam as an assembly to the seat frame. Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATIONCOVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#).
4. Position the seat cushion and frame assembly to the seat back frame and cushion assembly.
5. Install the second row seat pivot bolts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
6. Install the outer seat pivot covers and tighten the screws.
7. Install the second row seat. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATIONSEAT, SECOND ROW, REMOVAL AND INSTALLATION](#).

HEADREST, SECOND ROW

REMOVAL AND INSTALLATION

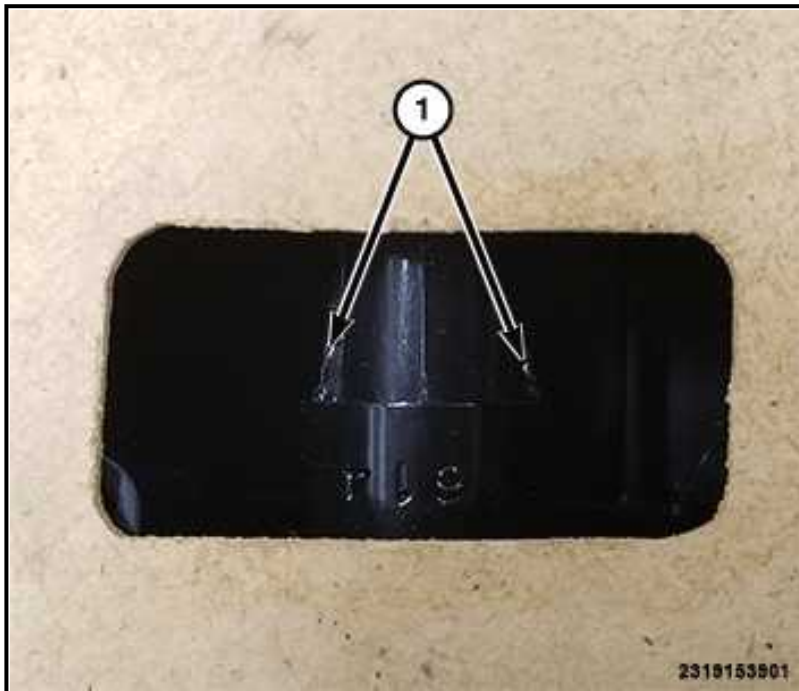
CENTER HEADREST



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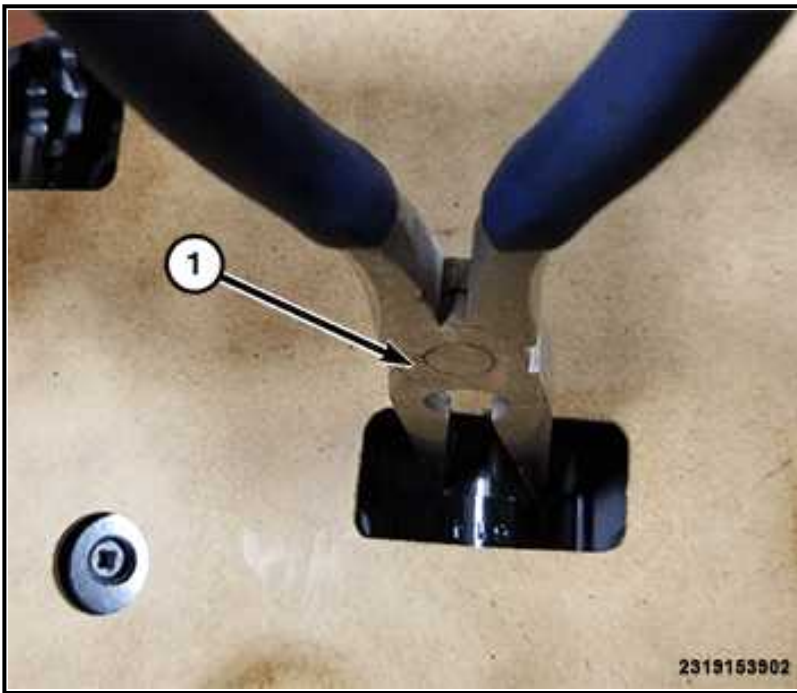
REMOVAL

1. Fold down the 60% seat back.
2. Open the zippers (1) and release the J-hook (2) on the seat back.
3. Lift the rear seat back cover.
4. Remove the center headrest and note the orientation of the tubes.



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5. Access the holes in the rear seat back panel under head rest.
6. Locate the tabs at the bottom of the headrest tubes (1).



7. Using a suitable tool (1), release the tabs on the headrest tubes and remove the tubes from the seat.

INSTALLATION

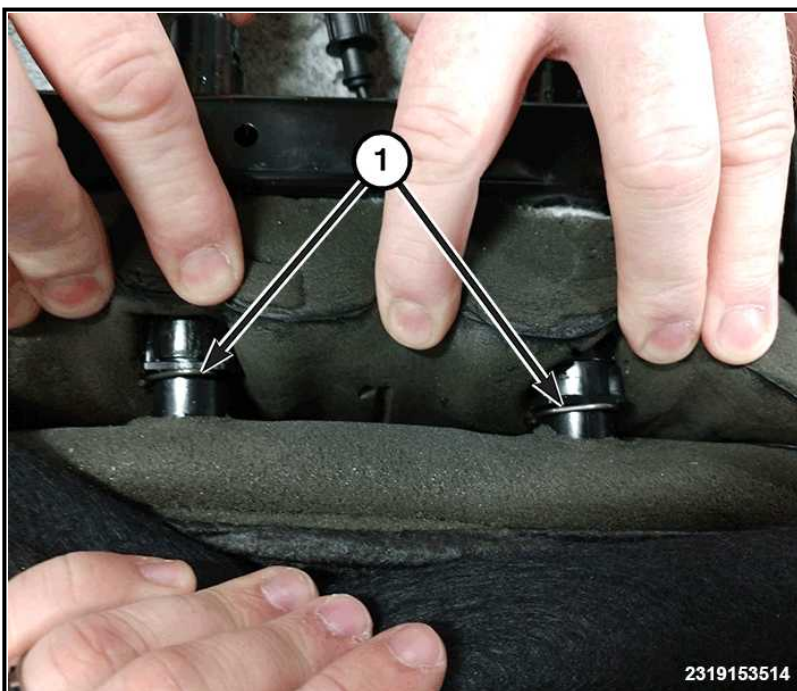
1. Install the headrest tubes in the seat in the proper orientation, as noted in the removal. Be certain the tabs have engaged fully.
2. Install the headrest into the head rest tubes.
3. Position the rear seat back cover.
4. Close the seat back cover by fastening the zippers and J-hook.

OUTBOARD HEADREST

NOTE: This procedure only applies to the outboard headrests.

REMOVAL

1. Remove the seat back panel. Refer to [PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION](#) [PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION](#).



2. Remove the headrest and note the orientation of the headrest sleeves.
3. Lift up on rear seat foam and remove the clips (1) at top of the headrest tube.



4. Squeeze the tabs (1) and pull out the headrest with the headrest sleeves.

INSTALLATION

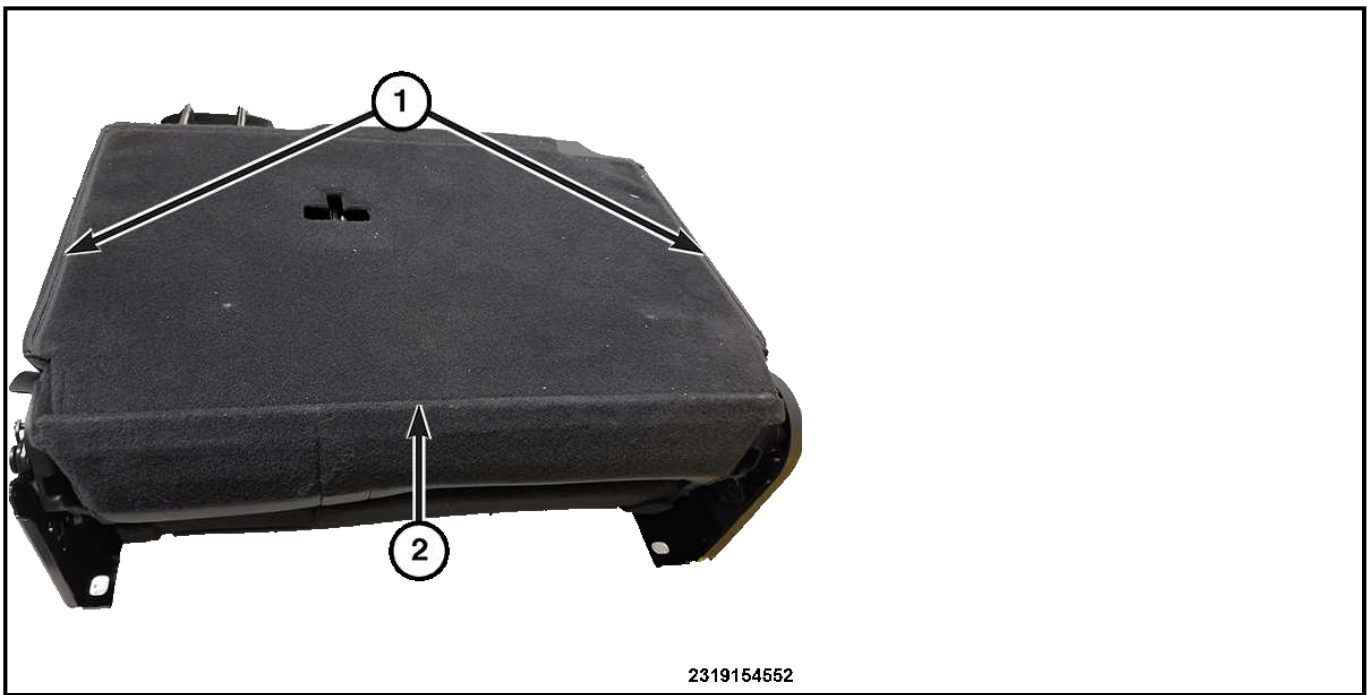
1. Install the headrest sleeves with the headrest in the correct orientation, as noted in the removal.
2. Install the clips at top of headrest sleeves.
3. Install the seat back panel. Refer to **PANEL, SEAT BACK, FRONT, REMOVAL AND INSTALLATION****PANEL, SEAT BACK, SECOND ROW, REMOVAL AND INSTALLATION.**

PANEL, SEAT BACK, SECOND ROW

REMOVAL AND INSTALLATION

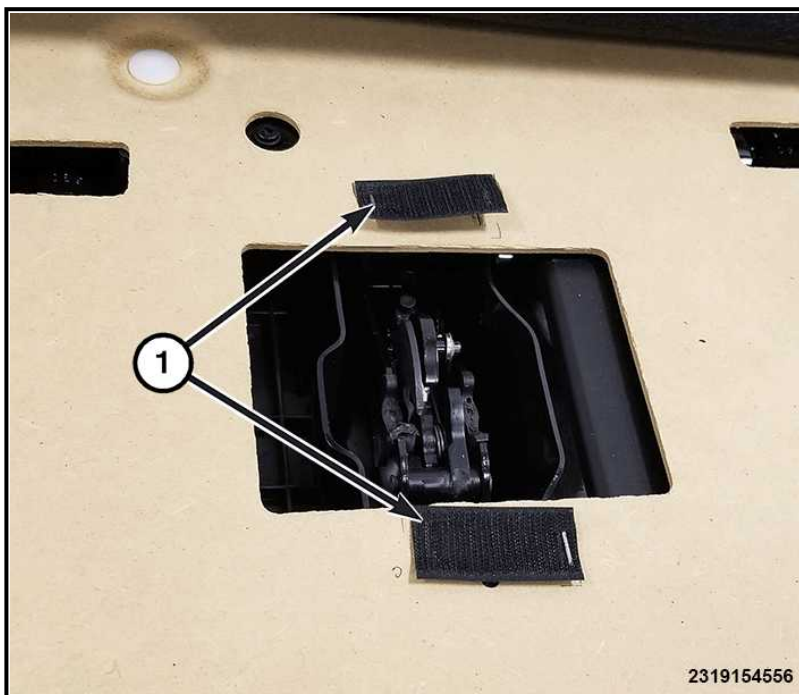
REMOVAL AND INSTALLATION

NOTE: Right side as shown in illustration, left side similar.

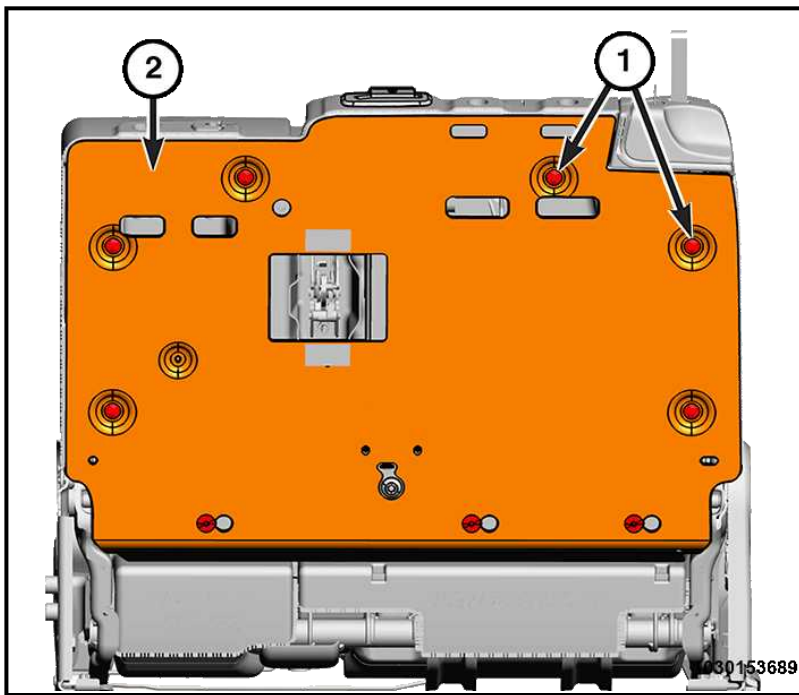


REMOVAL

1. Fold the seat back down.
2. Release the J-hook strip (2) at the bottom of the seat back cover.
3. Open the zippers (1) on each side of the seat back cover.



4. Remove the hook and loop fasteners (1) that secures the seat back cover to the seat back panel.
5. Separate the hook and loop straps at the bottom of the seat cover.
6. Remove the screw securing the seat back panel to the seat back frame.



7. Remove the nine push fasteners (1) that secure the seat back panel (2) to the seat back frame.

INSTALLATION

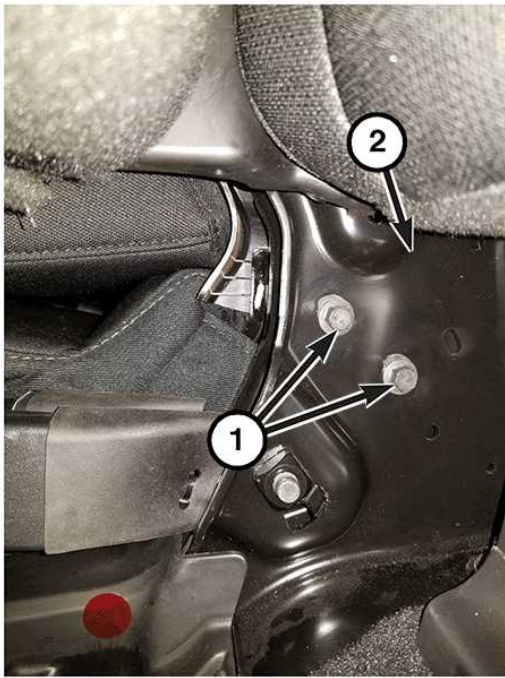
1. Position the seat back panel to the seat frame.
2. Install the nine push fasteners that secure the seat back panel to the seat back frame.
3. Install the screw securing the seat back panel to the seat back frame and tighten securely.
4. Fasten the hook and loop straps at the bottom of the seat cover.
5. Fasten the hook and loop fasteners that secures the seat back cover to the seat back panel.
6. Close the zippers on each side of the seat back cover.
7. Fasten the J-hook strip at the bottom of the seat back cover.

SEAT, SECOND ROW

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

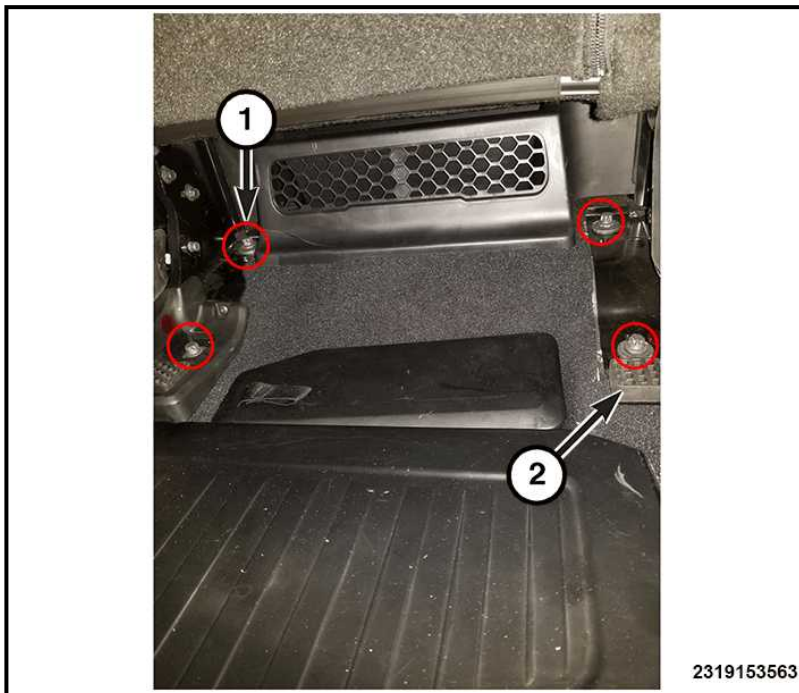
NOTE: The 40% and 60% rear seats are removed and installed similarly.



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REMOVAL

1. Raise the seat cushion on the driver side rear seat.
2. Remove the bolts (1) from seat frame (2) on the 40% side of the seat.
3. Remove the screws for the trim between the center seat bolts and remove the trim.



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4. Remove the bolts (1) from the seat lower frame (2).
5. Lift and remove the seat from the vehicle.

INSTALLATION

1. Position the seat in the vehicle.
2. Install the bolts loosely in the seat frame on the 40% side.
3. Install the second row seat bolts and tighten to the proper. Refer to [**TORQUE SPECIFICATIONS**](#).
4. Position the center seat bolts trim and install the screws. Tighten the screws securely.

5. Tighten the bolts that hold the 40% seat frame 60% seat frame and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

STATIONARY GLASS

WARNING

WARNING:

Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly in an accident.

- Urethane adhesives are applied as a system. Use glass cleaner, glass prep solvent, glass primer, PVC (vinyl) primer and pinch weld (fence) primer provided by the adhesive manufacturer. If not, structural integrity could be compromised.
- FCA US LLC does not recommend glass adhesive by brand. Technicians should review product labels and technical data sheets, and use only adhesives that their manufactures warrant will restore a vehicle to the requirements of FMVSS 212. Technicians should also insure that primers and cleaners are compatible with the particular adhesive used.
- Be sure to refer to the urethane manufacturer's directions for curing time specifications, and do not use adhesive after its expiration date.
- Vapors that are emitted from the urethane adhesive or primer could cause personal injury. Use them in a well-ventilated area.
- Skin contact with urethane adhesive should be avoided. Personal injury may result.
- Always wear eye and hand protection when working with glass.

CAUTION:

Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

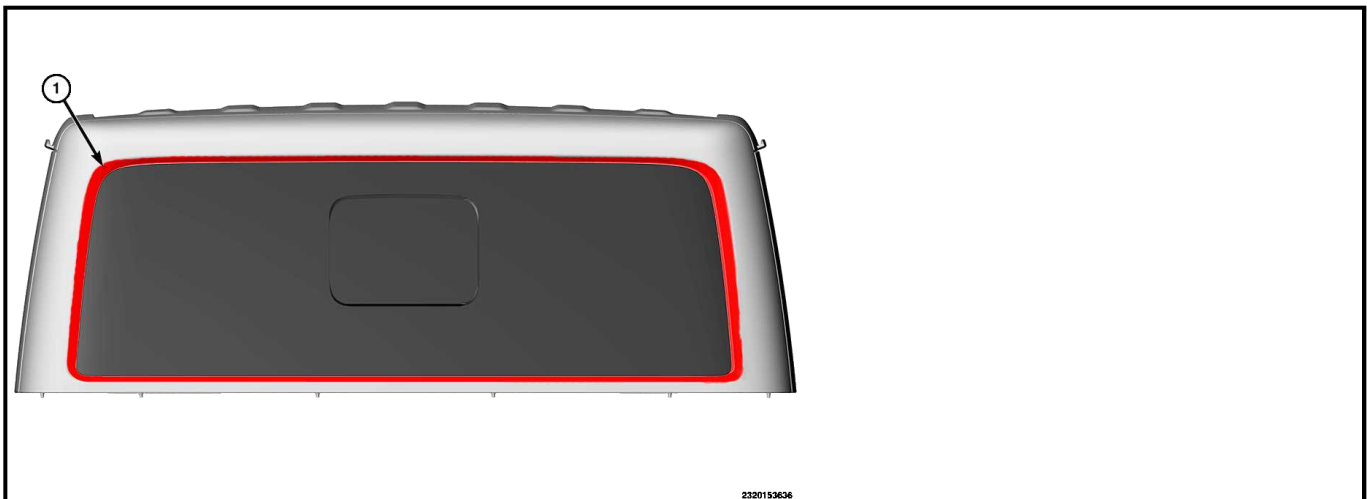
Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

BACKLITE

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



CAUTION:

It is difficult to salvage the backlite during the removal operation. The urethane bonding used to secure the glass to the fence is difficult to cut or clean from any surface. Since the molding is set in urethane, it is unlikely it would be salvaged. Before removing the backlite, check the availability from the parts supplier.

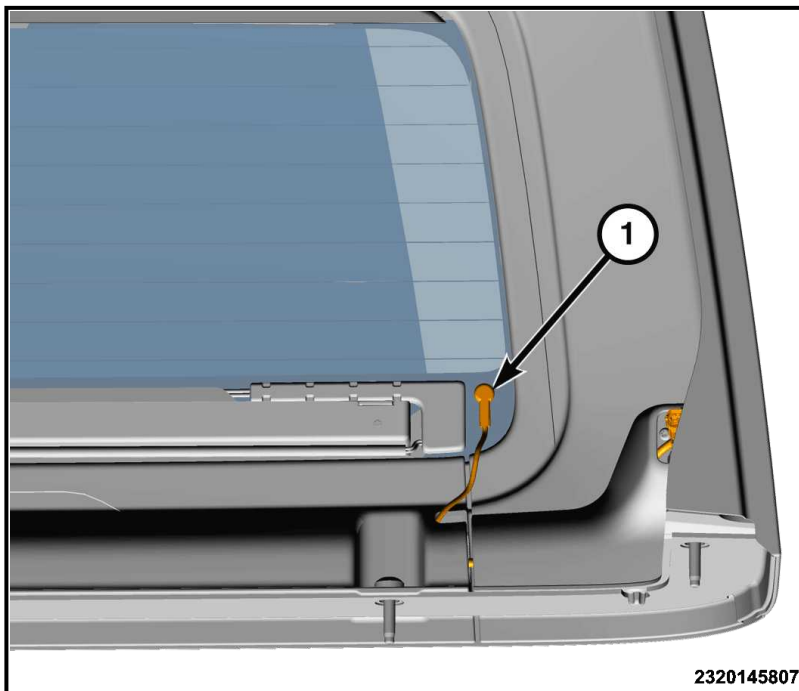
NOTE:

Take care using any tools to avoid top damage in the location indicated by the illustration.

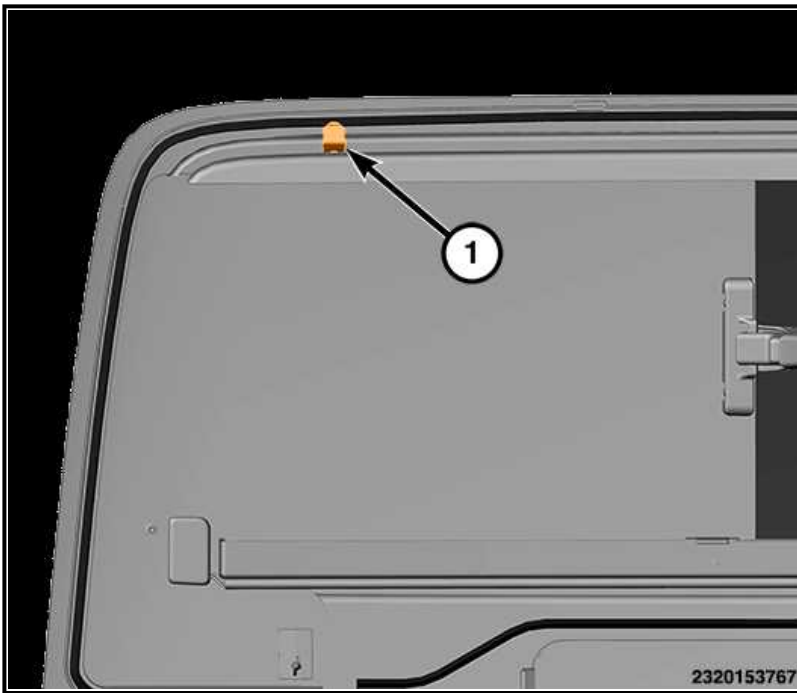
NOTE:

The backlite is attached to the window frame with urethane adhesive. The urethane adhesive is applied cold and seals the surface area between the window opening and the glass. The primer adheres the urethane adhesive to the backlite.

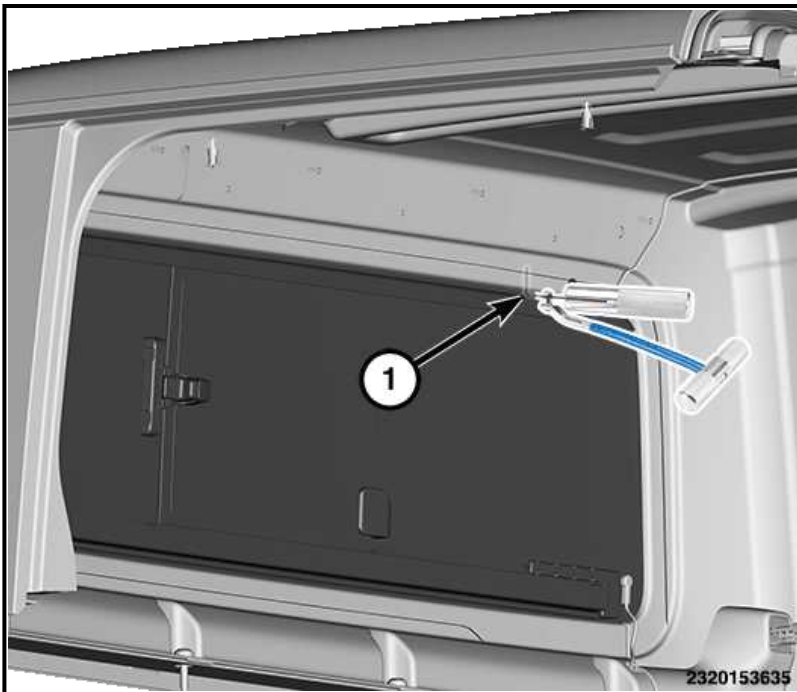
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



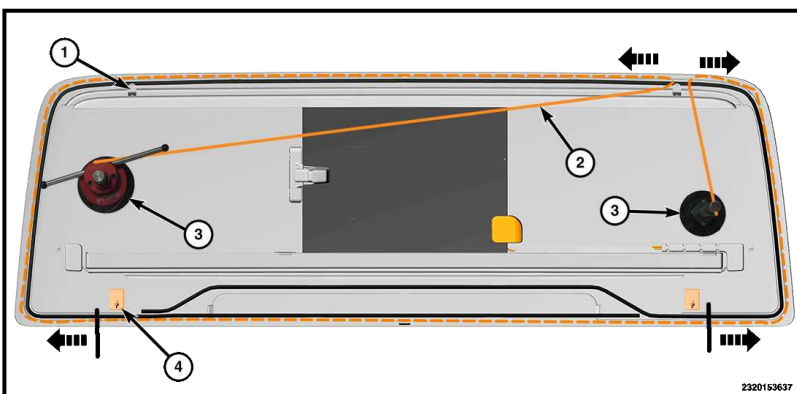
2. Remove the rear header panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#).
3. Disconnect the electronic backlite grid connectors (1) from both sides of the glass, if equipped.



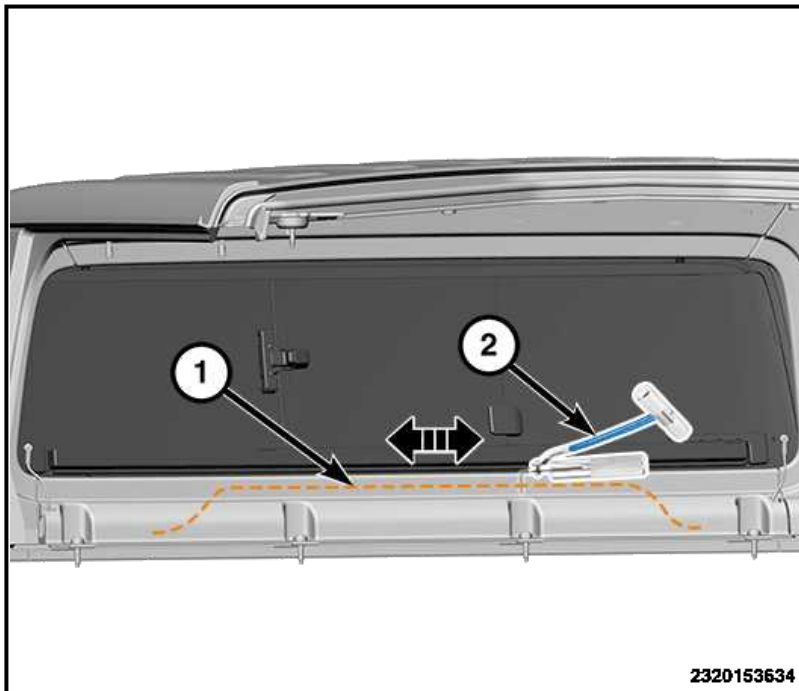
4. Bend the top tabs (1) down out of the way.



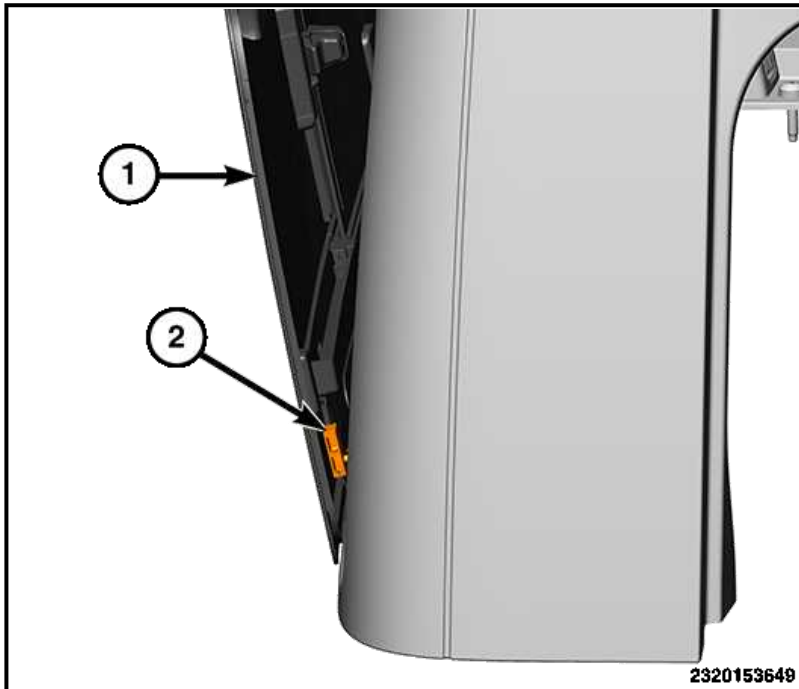
5. From inside the vehicle, separate the top adhesive using a pull knife (1) or equivalent, to aid installation of the wire removal tool.



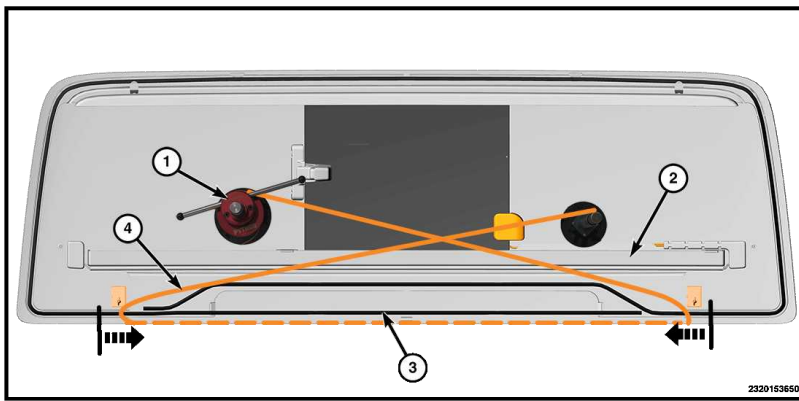
6. Install the nylon cable (2) out through the opening in the adhesive made previously and position around the perimeter of the glass as indicated.
7. Using an assistant and a windshield Rotating Wire Removal System tool (3), cut and separate the urethane adhesive securing the glass to the fence and stopping at the support pins (4). Use a trim stick or equivalent to aid in guiding the nylon cable around the glass channels as needed.



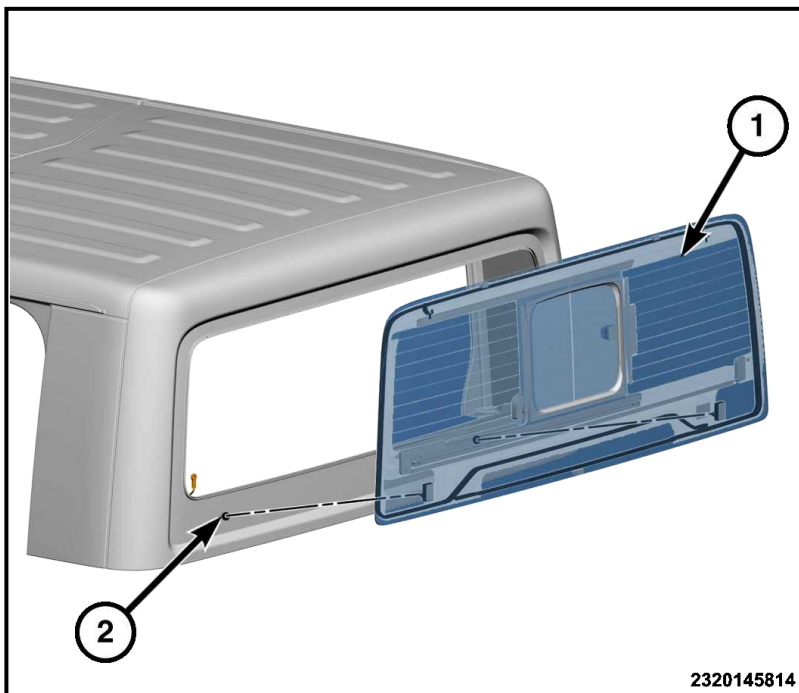
8. From inside the vehicle, separate the lower adhesive (1) using a pull knife (2) or equivalent. This will aid in gaining access to the lower support pins.



9. Position the glass (1) back to expose the support pins (2) at the bottom.
10. Using a small flat bladed tool or equivalent, separate the two sided tape securing the support pins (2) to the glass.



11. Reposition the nylon cable (4) through the glass opening to cut the remaining adhesive at the bottom (3) of the glass as indicated.
12. Using an assistant and a windshield Rotating Wire Removal System tool (1), cut and separate the remaining urethane adhesive (3) securing the bottom of the glass to the fence and remove the glass. Use a trim stick or equivalent to aid in guiding the nylon cable around the glass channels (2) as needed.



13. Separate glass (1) from vehicle.

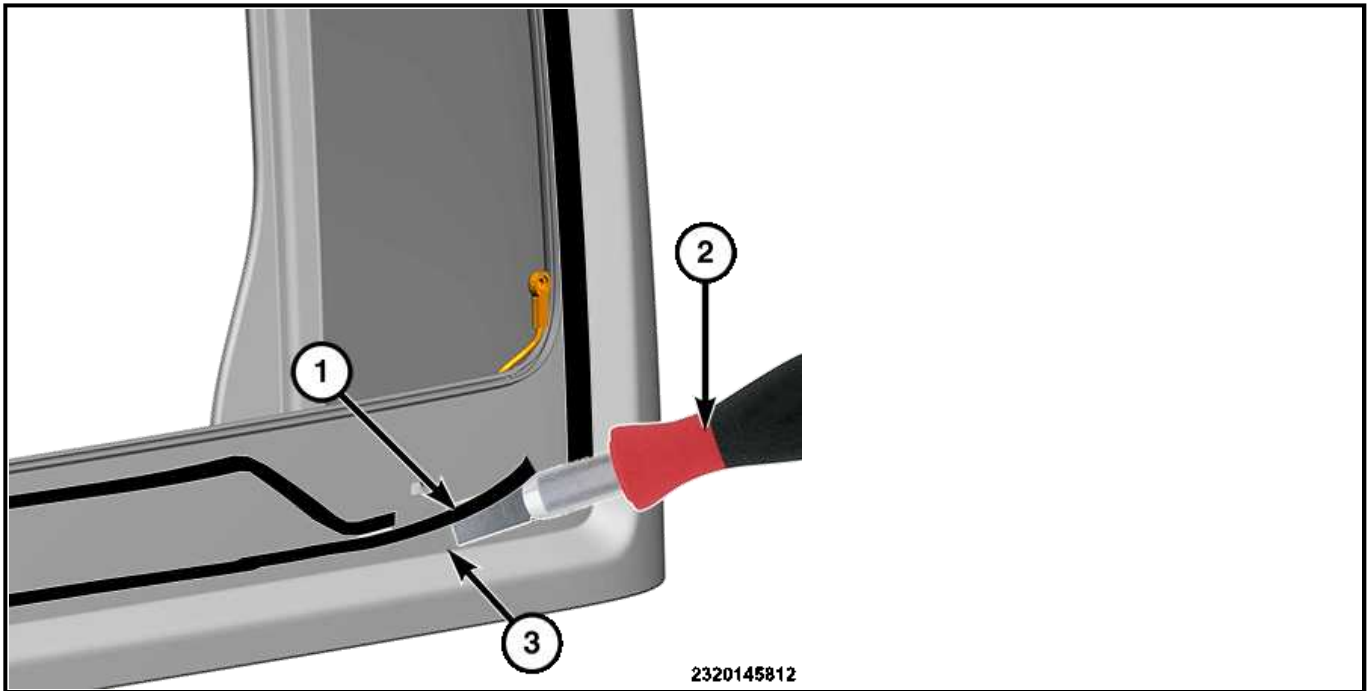
WARNING: Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly if the vehicle is in an accident.

CAUTION: To help prevent water leaks, partially roll down the left and right door glass before installing the windshield. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

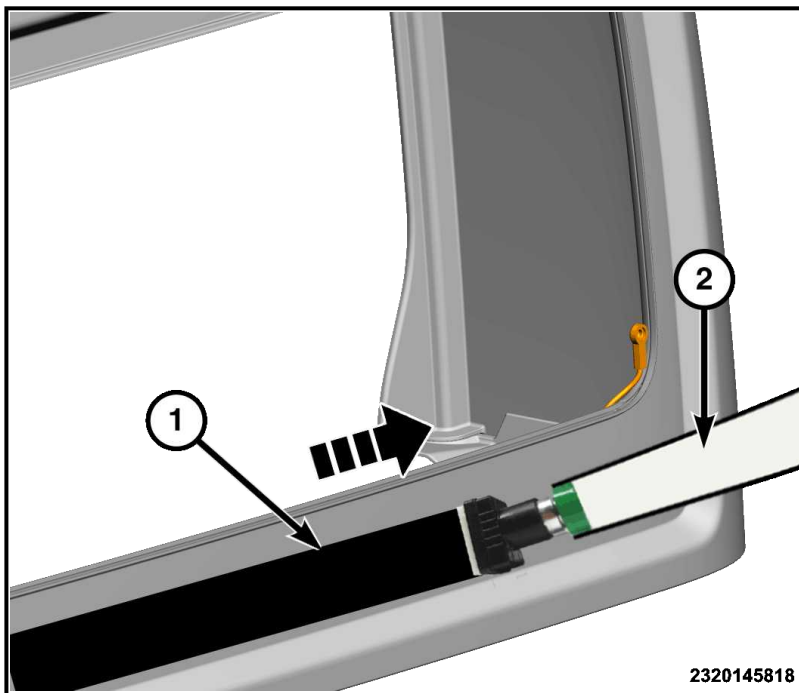
NOTE: The glass fence should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm in height should remain on the fence. Do not completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected.

NOTE: Do not use solvent based glass cleaners to clean the backlite before applying glass prep and primer or poor glass adhesion may result.

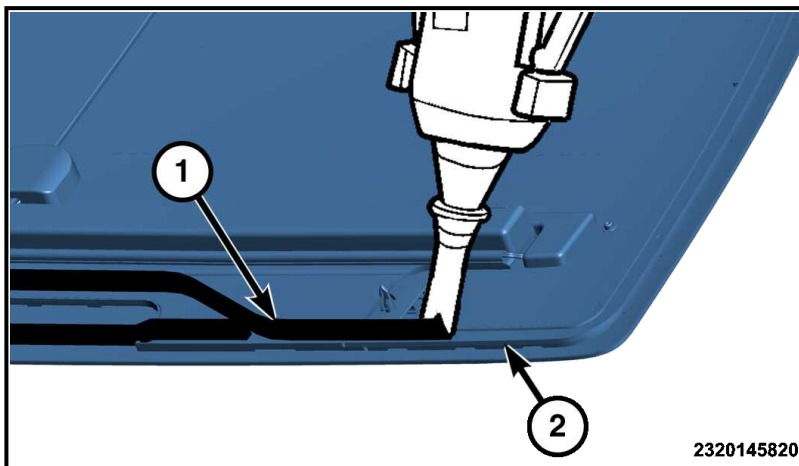


INSTALLATION

1. With a sharp flat bladed tool (2) equipped with an appropriate width blade, trim the remaining bead of adhesive (1) down to approximately 1 mm (0.04 in). Use care not to damage the edge of the top (3). Do not completely remove all old urethane from the frame, the paint finish and bonding strength will be adversely affected.
2. Clean the inside of the glass with an ammonia based glass cleaner and a lint-free cloth.
3. Apply glass prep adhesion promoter 25 mm (1 in.) wide around the perimeter of the glass and 5 mm (0.2 in.) from the edge of the glass and let air dry without wiping.
4. Apply glass primer 25 mm (1 in.) wide around the perimeter of the glass and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
5. Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the glass.
6. Re-prime any area that is not fully and evenly primed.



7. Clean the glass fence with an ammonia based glass cleaner and a lint-free cloth.
8. With the use of the applicator (2), apply pinch weld primer 25 mm (1 in.) wide (1) around the glass fence. Allow at least three minutes drying time.
9. Using a flashlight, verify that the primer is completely and evenly installed along the glass fence.
10. Re-prime any area that is not fully and evenly primed.



ADHESIVE WIDTH 7 mm (0.275 in)
ADHESIVE HEIGHT 13 mm (0.50 in)

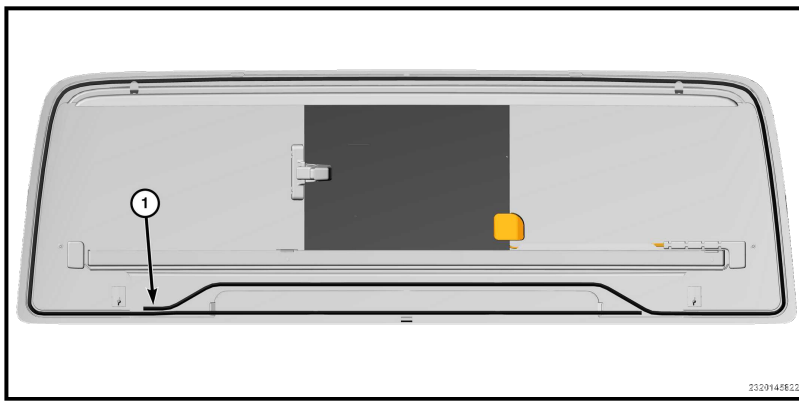
CAUTION: Always apply bead of adhesive to the backlite. Always install the backlite within 5 minutes after applying adhesive.

NOTE: If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

Apply bead of adhesive (1) with a triangular nozzle directly on the glass.

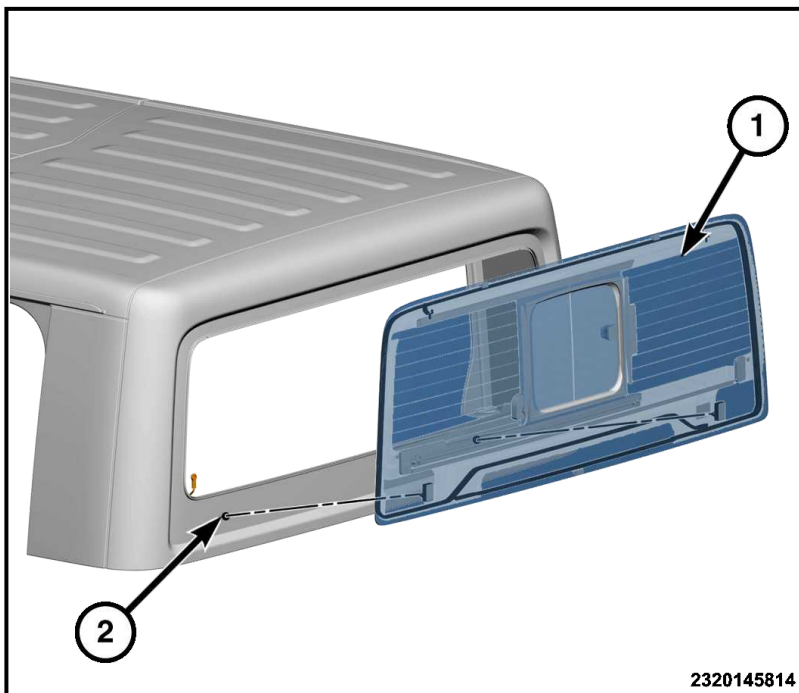
11. Apply approximately a 7 mm (0.3 in.) wide and 13 mm (0.5 in.) tall bead of adhesive (1) with a triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass (2) starting at the bottom center of the glass.

NOTE: Make sure the bead of adhesive is placed on the primer fully.



12. Run the end of the adhesive bead (1) on the glass parallel to the start of the bead and smooth the ends flush.

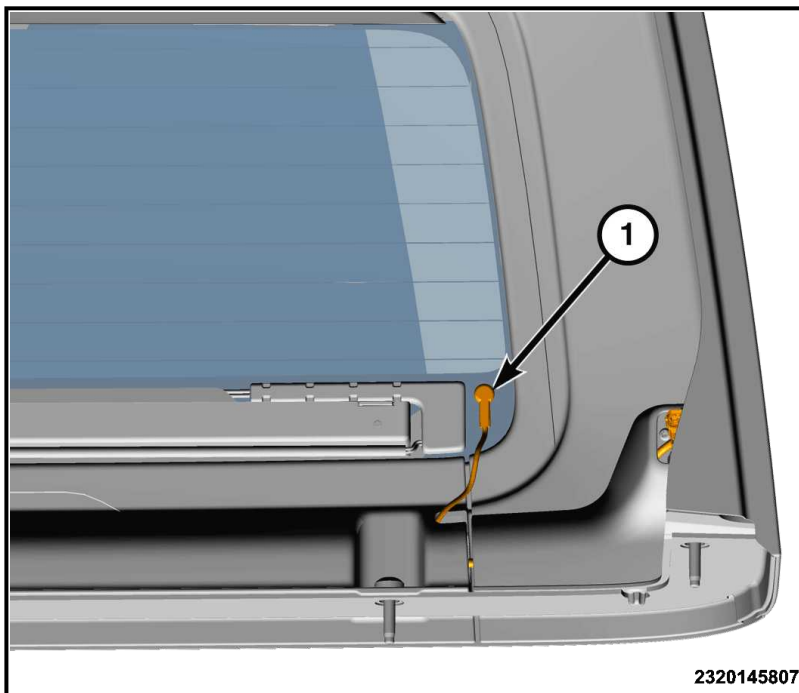
NOTE: Make sure there are no gaps present in the adhesive bead and ends.



WARNING: Allow the urethane at least 24 hours to cure before returning the vehicle to use.

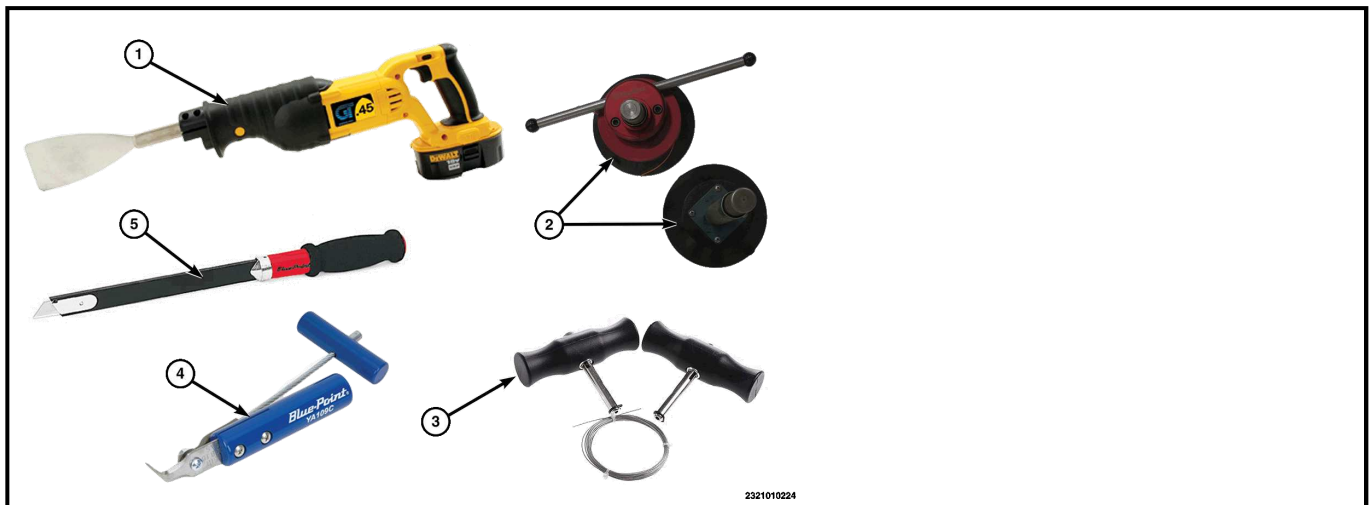
NOTE: Roll down the left and right front door glass before installing backlite. This is to avoid pressurizing the passenger compartment if a door is slammed before the urethane is cured. The potential for water leaks can result.

13. Locate the glass assembly (1) to the backlight opening. Align the pins on the glass assembly with the holes (2) in the bottom corners of the backlight opening.
14. Apply hand pressure to the outside glass surface, around the entire periphery, to assure proper seating of the glass to the backlight opening. The glass must be seated to the rest blocks.



15. Connect the electronic backlite grid connectors (1) to both sides, if equipped.
16. Install the rear cab header panel. Refer to **PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION**.
17. Connect the negative battery cable(s). Refer to the appropriate service information .

GLASS REMOVAL TOOLS



Common Glass Tools Needed to Remove Stationary Glass

- 1 - ExtractorB® Express™ or equivalent, equipped with flat blade
- 2 - Rotating Wire Removal System
- 3 - Two handled wire type cut-out tool
- 4 - Cold knife equipped with a 25 mm (1.0 in.) blade or a 38 mm (1.5 in.) blade
- 5 - Long knife

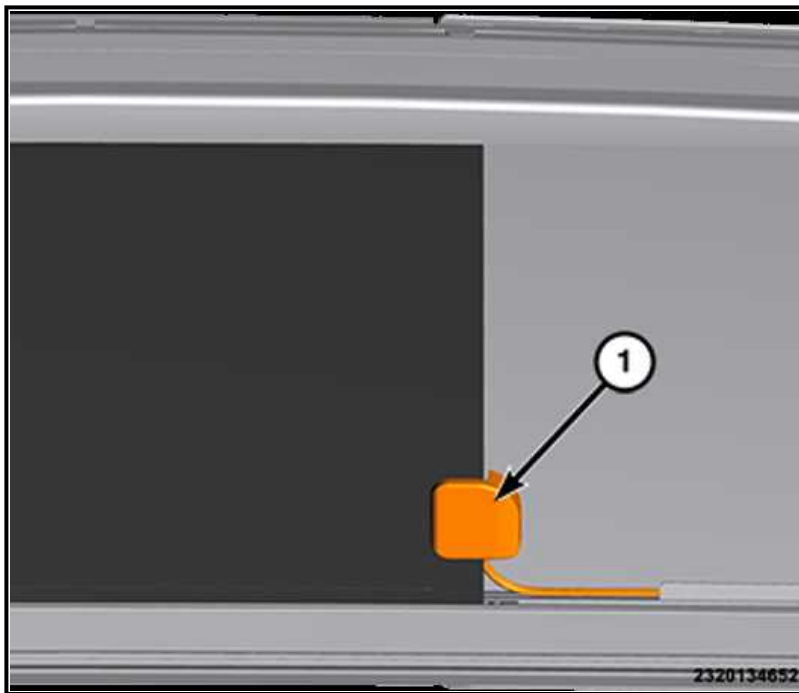
BACKLITE, SLIDING

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

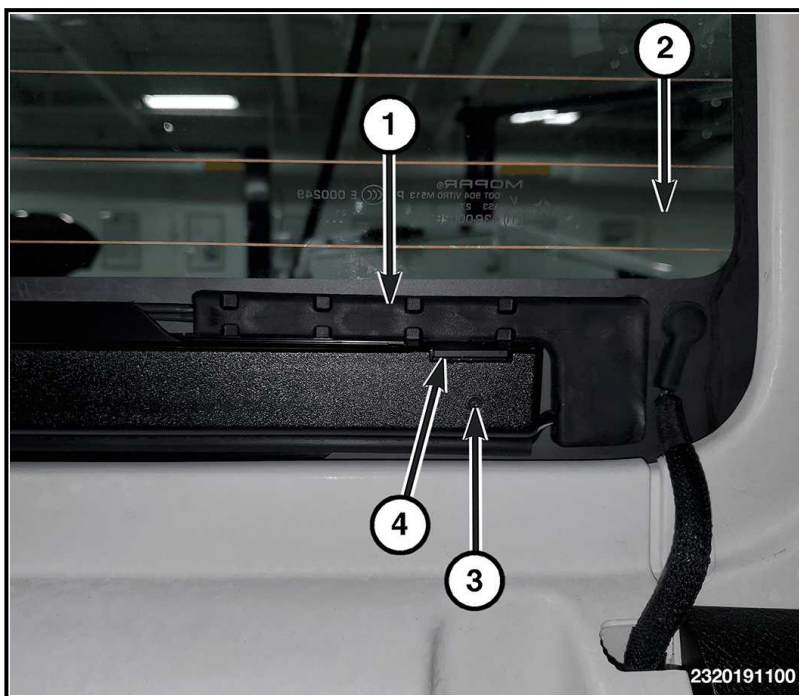
REMOVAL

1. Open the center glass approximately 8 cm (3 in).



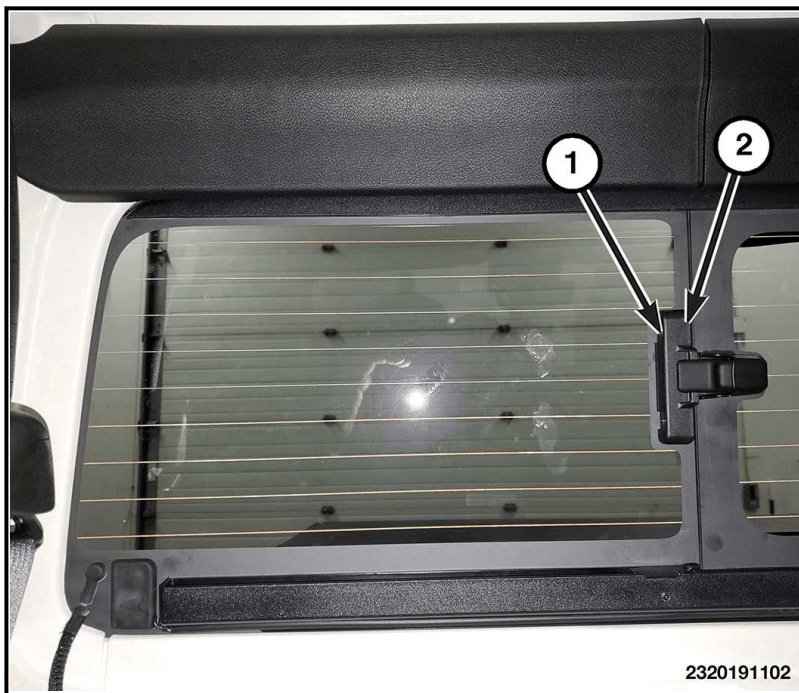
1 - Heated Glass Wire Harness Connector

2. Disconnect the heated glass wire harness connector on the sliding glass.



1 - Electrical Connector
2 - Stationary Glass
3 - Fasteners
4 - Lower Window Track Stops

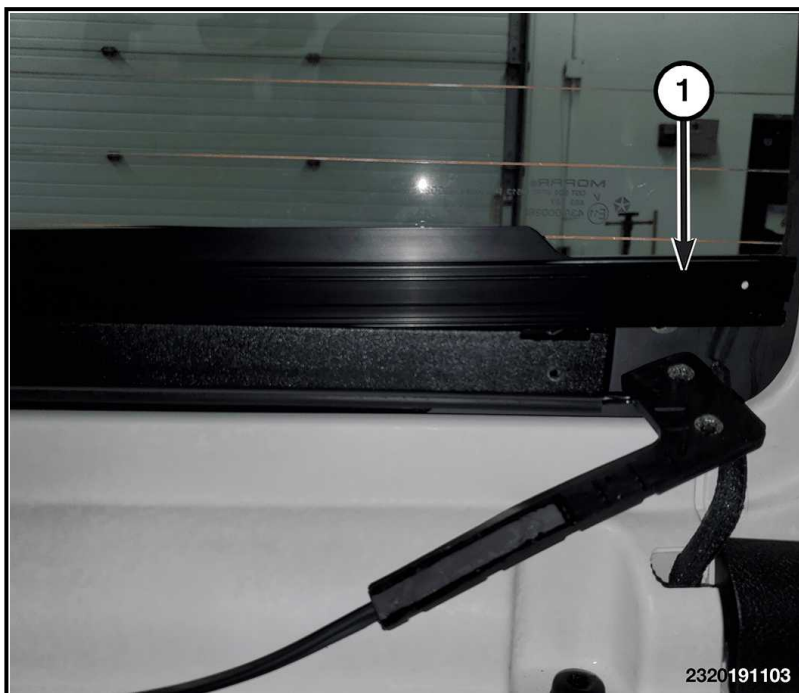
3. Disconnect the electrical connector along with the two sided tape and snaps from the stationary glass.
4. Remove the fasteners from both lower window track stops.
5. Remove both lower window track stops.



1 - Fastener

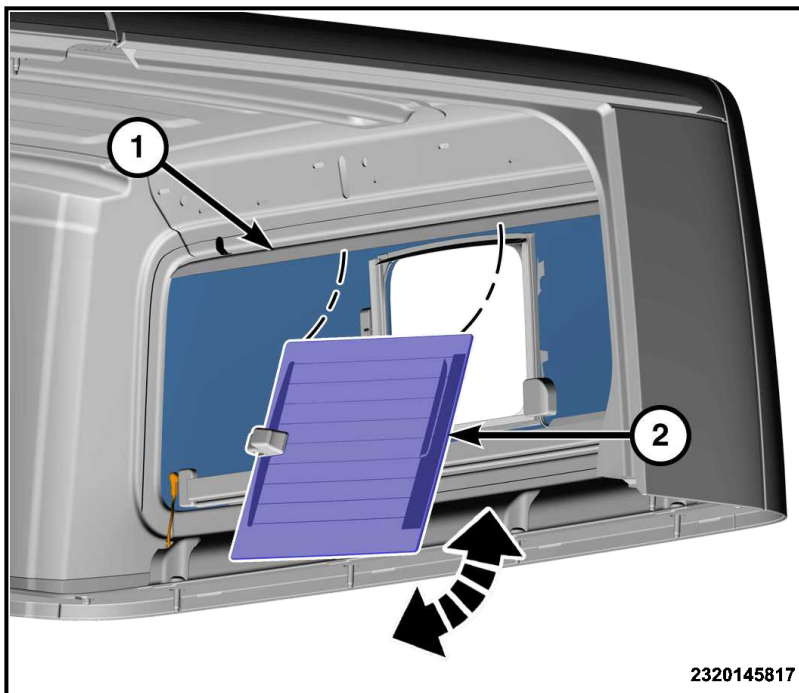
2 - Window Latch Stop

6. Remove the fasteners from the window latch stop on the stationary glass.
7. Slide window all the way towards passenger side.



1 - Lower Track

8. Lift and slide lower track towards driver side.



1 - Window Frame

2 - Sliding Glass

9. Lift the sliding glass upward and pull the bottom out of the lower channel.
10. Remove the sliding glass out of the window frame on the passenger side.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Verify proper operation of the glass.

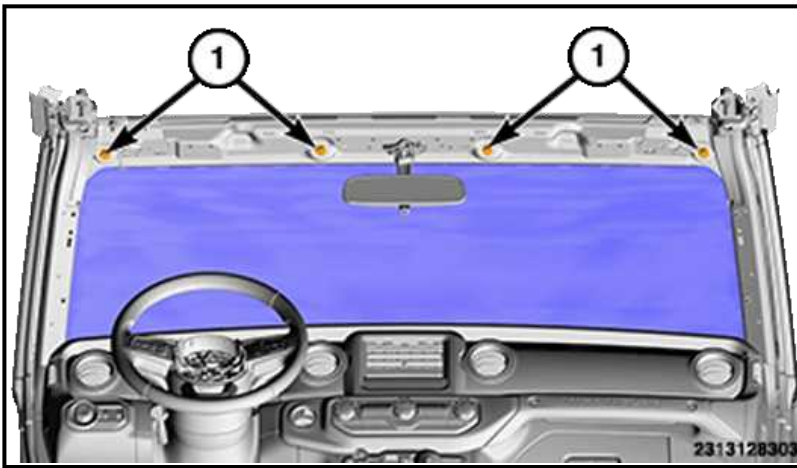
FRAME, WINDSHIELD

REMOVAL AND INSTALLATION

WINDSHIELD FRAME

REMOVAL

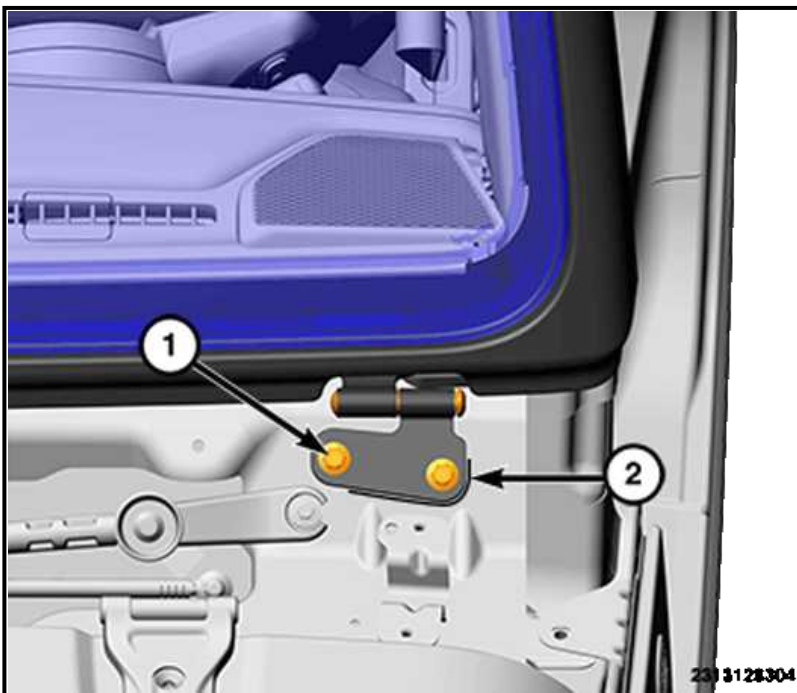
1. On vehicles equipped with a power top assembly, remove the top (Refer to the appropriate service information).
2. If equipped, remove the Freedom Tops. Refer to [REMOVABLE TOP, HARD, REMOVAL AND INSTALLATION](#).
3. Open the soft top, if equipped.
4. Remove the wiper arms. Refer to [ARM, WIPER, REMOVAL AND INSTALLATION](#).



1 - Bolts

5. Remove the bolts securing the upper windshield frame to the header.

6. Remove the cowl trim. Refer to [COVER, COWL PANEL, REMOVAL AND INSTALLATION](#).



1 - Bolts

2 - Hinge to Body Marking

7. Using a suitable marking device, mark the position of the hinges on the body to aid installation.

8. Remove the bolts and with the aid of a helper, remove the windshield frame assembly.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- A suitable body sealant should be applied when removing or moving the hinges.
- Align the hinges to the reference marks made previously and tighten the hinge to body bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#).
- Tighten the windshield frame to header bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#).

WINDSHIELD

REMOVAL AND INSTALLATION

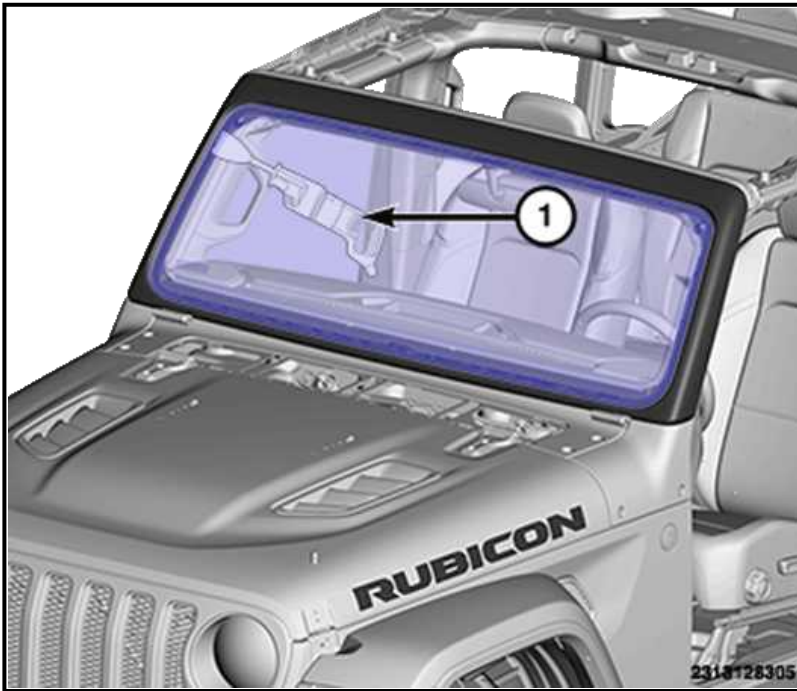
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

CAUTION: Be careful not to damage painted surfaces when removing moldings or cutting urethane around the windshield.

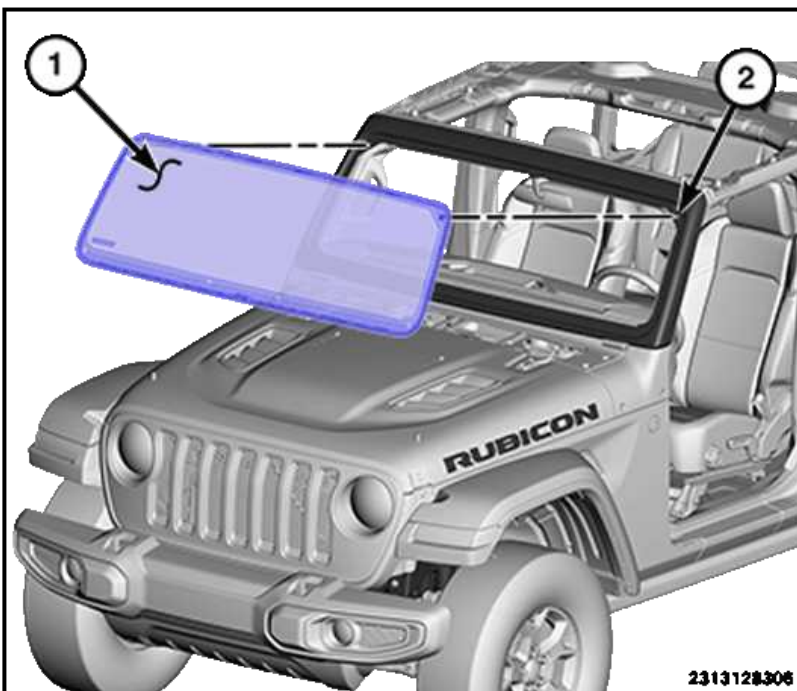
REMOVAL

1. Remove the wiper arms Refer to [ARM, WIPER, REMOVAL AND INSTALLATION](#) .
2. If equipped, remove the Driver Assist System Module (DASM). Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), REMOVAL AND INSTALLATION](#) .



1 - Cut-Out Tool

3. Using an assistant and a windshield cut-out tool, cut and separate the urethane adhesive securing the windshield to the windshield frame.



- | |
|----------------------|
| 1 - Windshield |
| 2 - Windshield Frame |

4. Carefully remove the windshield from the vehicle.

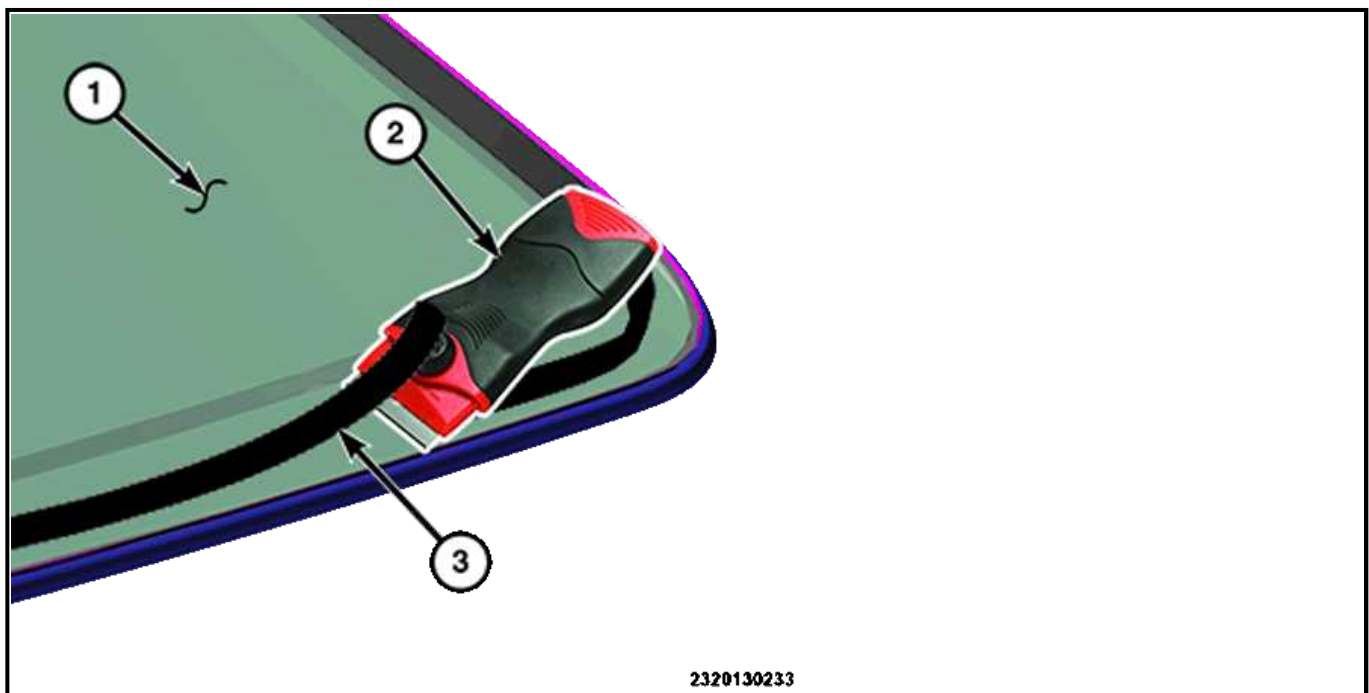
INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

WARNING: Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly if the vehicle is in an accident.

CAUTION: To help prevent water leaks, partially roll down the left and right door glass before installing the windshield. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

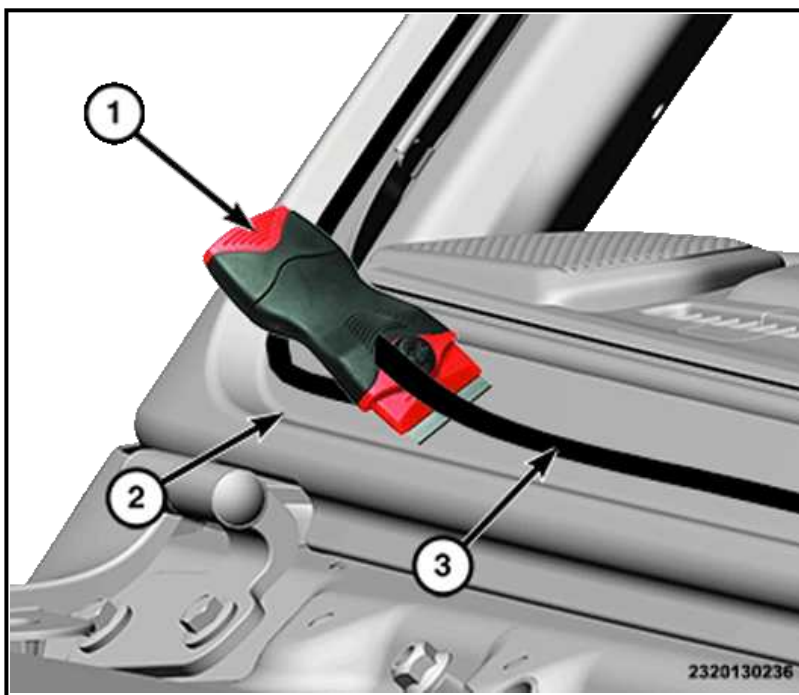


- | |
|-----------------------|
| 1 - Windshield |
| 2 - Razor Knife |
| 3 - Original Urethane |

- If the windshield is being reused, remove as much original urethane as possible from the glass surface using a razor knife.

NOTE: To prevent corrosion, do not damage paint on windshield frame when removing original urethane.

NOTE: The windshield frame should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm in height should remain on the frame. Do not completely remove all old urethane from the frame, the paint finish and bonding strength will be adversely affected.

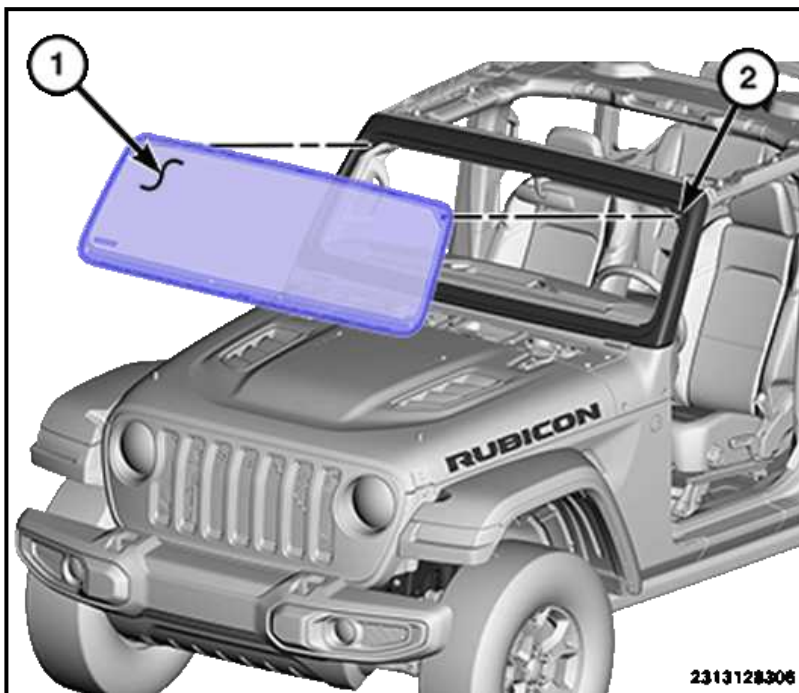


1 - Razor Knife

2 - Windshield Frame

3 - Original Urethane

- Using a razor knife, level the original bead of urethane on the windshield frame to a thickness of approximately 1 mm (0.04 in.) and remove the loose adhesive.

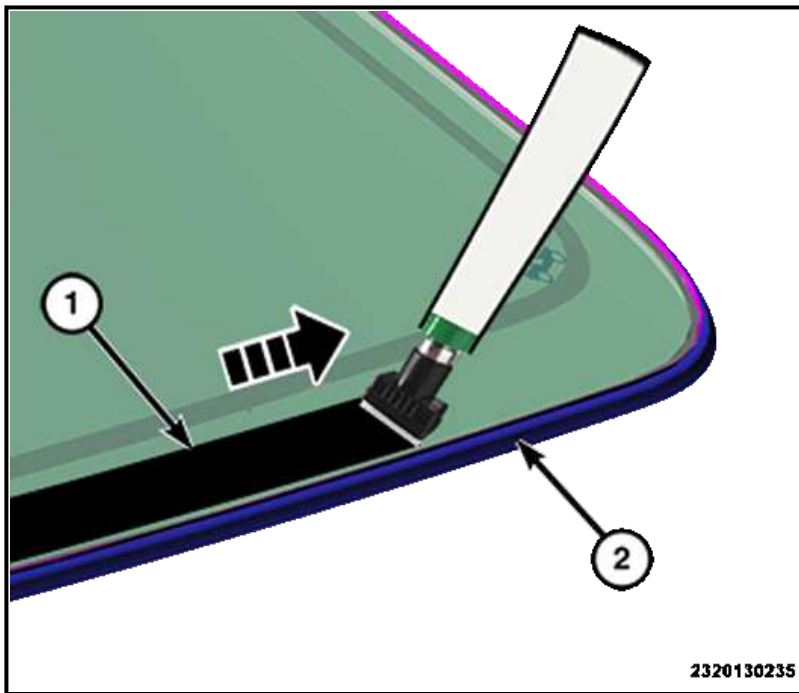


1 - Windshield

2 - Windshield Frame

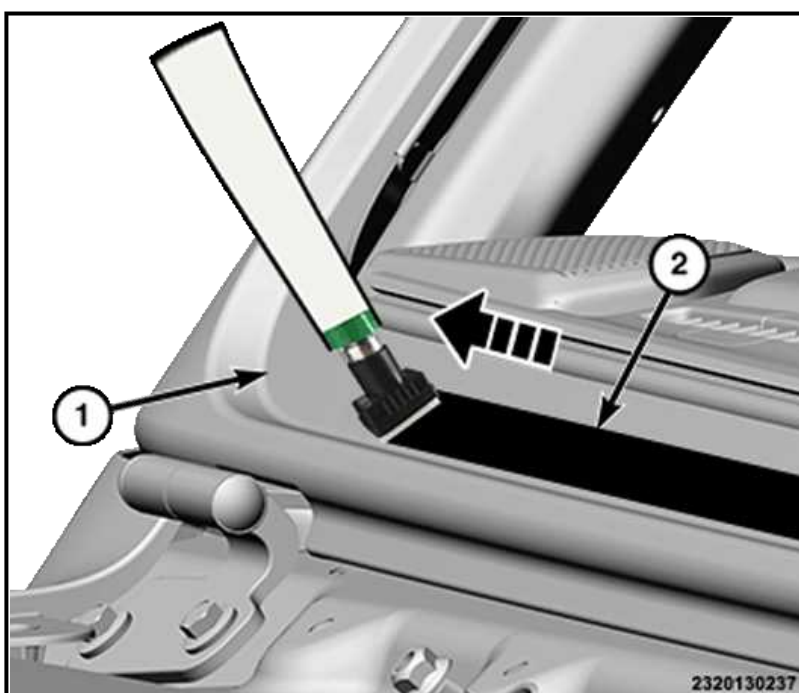
- Using an assistant, position the windshield into the windshield opening and against the windshield frame.
- Verify the windshield lays evenly against the frame at the top, bottom and sides of the opening. If not, the frame must be formed to the shape of the windshield.
- Mark the windshield and the windshield frame with pieces of masking tape to use as a reference for installation.

- Using an assistant, remove the windshield from the windshield opening and place it on a suitable padded work surface.



1 - Adhesion Promoter/Glass Primer
2 - Windshield Perimeter

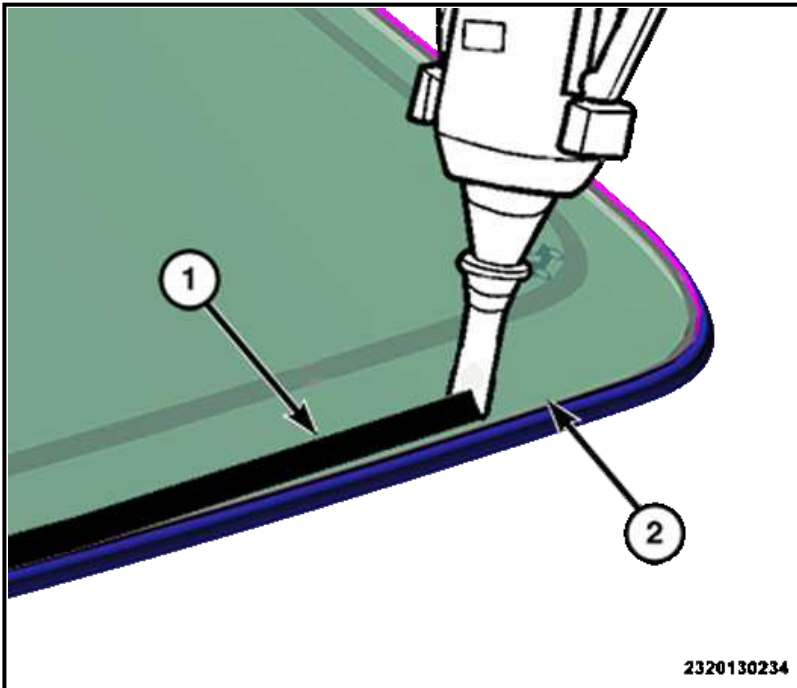
- Clean the inside of the windshield with an ammonia based glass cleaner and a lint-free cloth.
- Apply glass prep adhesion promoter 25 mm (1 in.) wide around the perimeter of the windshield and 5 mm (0.2 in.) from the edge of the glass and wipe dry with a clean lint-free cloth until no streaks are visible.
- Apply glass primer 25 mm (1 in.) wide around the perimeter of the windshield and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
- Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the windshield.
- Re-prime any area that is not fully and evenly primed.



1 - Primer

2 - Windshield Frame

- Clean the windshield frame with an ammonia based glass cleaner and a lint-free cloth.
- Apply pinch weld primer 25 mm (1 in.) wide around the windshield frame. Allow at least three minutes drying time.
- Using a flashlight, verify that the primer is completely and evenly installed along the windshield frame.
- Re-prime any area that is not fully and evenly primed.



1 - Adhesive

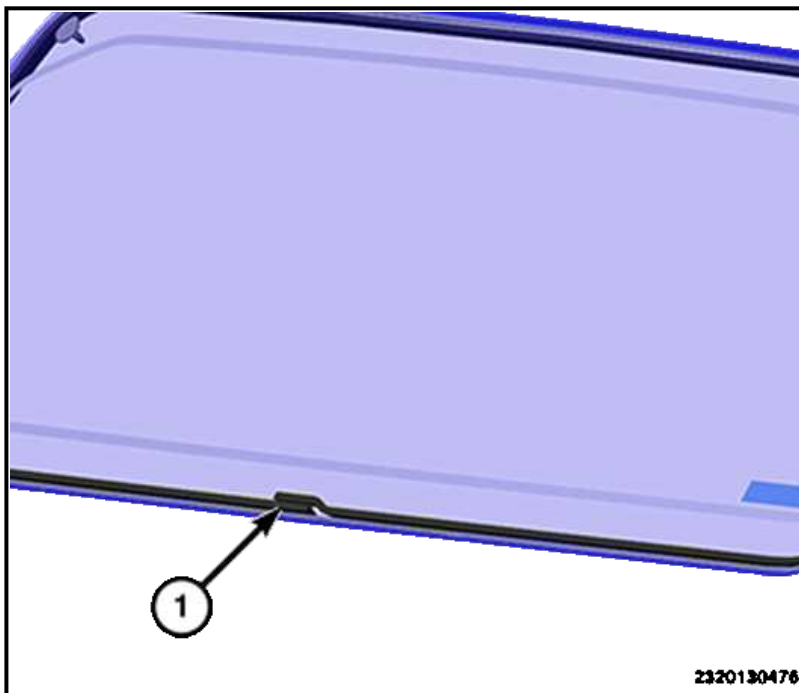
2 - Glass

CAUTION: Always apply the bead of adhesive to the windshield. Always install the windshield within 5 minutes after applying the adhesive.

NOTE: If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

- Apply approximately a 7 mm (0.3 in.) wide and 13 mm (0.5 in.) tall bead of adhesive with a triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass starting at the bottom center of the windshield.

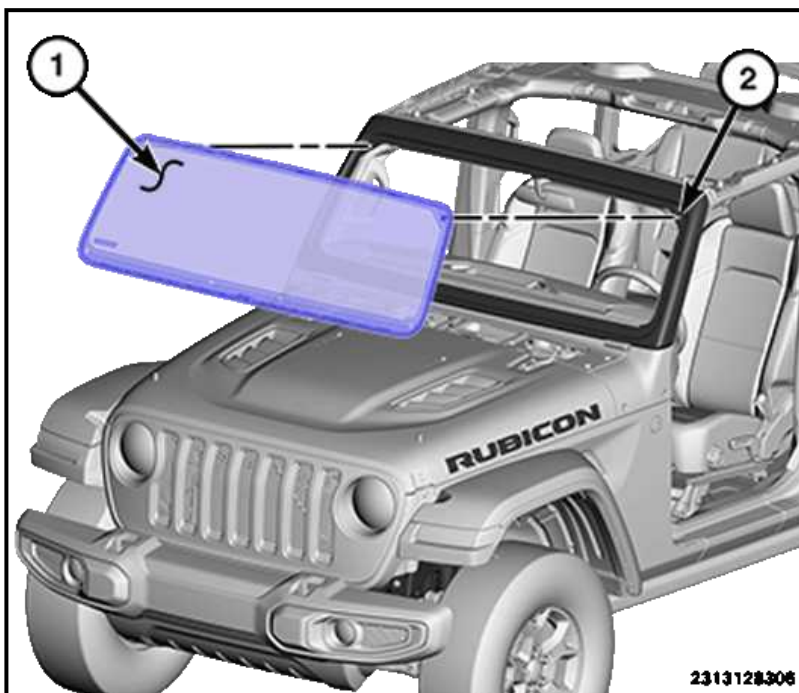
NOTE: Make sure the bead of adhesive is placed on the primer fully.



1 - Adhesive Bead End

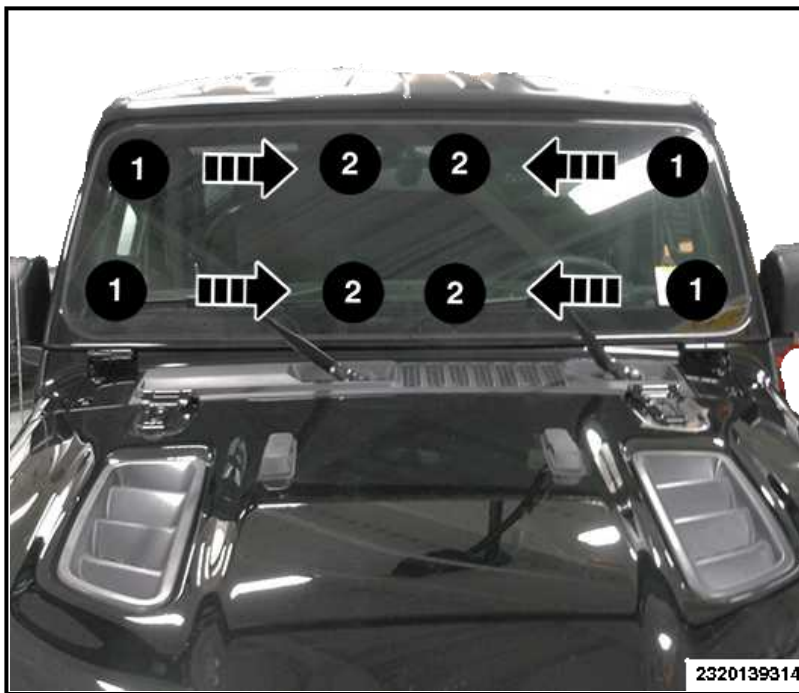
- Run the end of the adhesive bead on the windshield parallel to the start of the bead and smooth the ends flush.

NOTE: Make sure there are no gaps present in the adhesive bead and ends.



1 - Windshield
2 - Windshield Frame

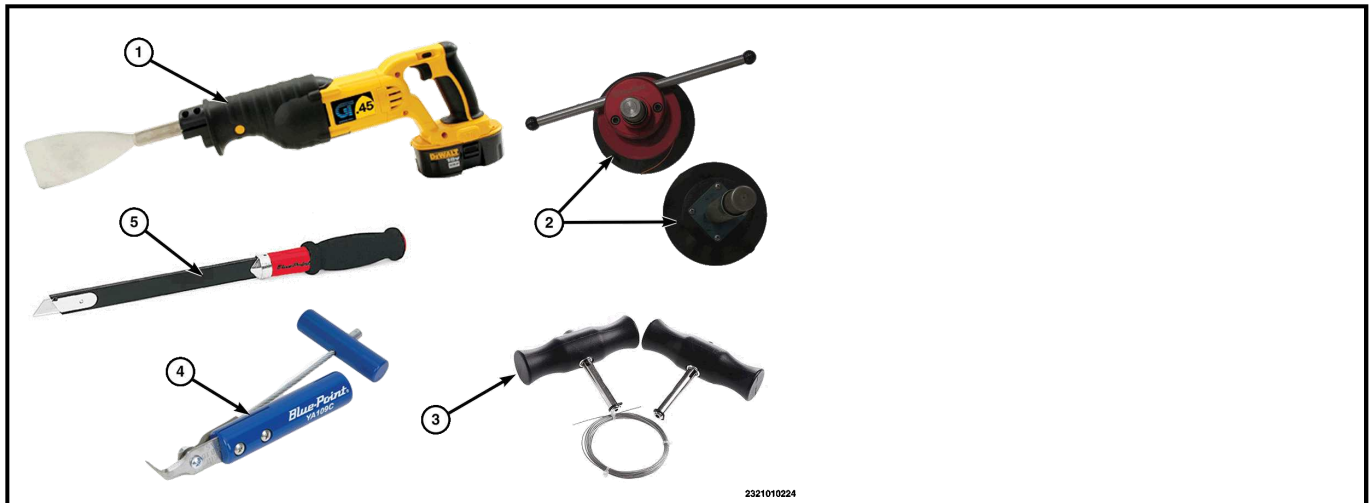
- Using an assistant, position the windshield over the windshield opening.
- Using the tape as reference points, align the windshield to the opening.
- Carefully lower the windshield onto the windshield frame. Guide the windshield into its proper location.
- Push the windshield inward until the windshield comes into contact with the location pins located on each side of the upper windshield frame.



1 - A-pillars
2 - Glass

- Seat the windshield glass firmly starting at the top and the bottom A-pillars and working inward to the center on the top and bottom until the standoff bottoms out onto the frame. Hold in position until the glass feels solid and make sure glass is underflush around the entire frame.
- Slowly add pressure inboard and press the center of the glass underflush as far as possible.
- Make sure the glass is in the center of the frame opening and that the lips of the lace molding are not gapping and seated equally around the perimeter of the glass.

GLASS REMOVAL TOOLS



Common Glass Tools Needed to Remove Stationary Glass

- 1 - ExtractorB® Express™ or equivalent, equipped with flat blade
- 2 - Rotating Wire Removal System
- 3 - Two handled wire type cut-out tool
- 4 - Cold knife equipped with a 25 mm (1.0 in.) blade or a 38 mm (1.5 in.) blade
- 5 - Long knife

WEATHERSTRIP/SEALS

CAUTION

Some body mounted weatherstrips are sealed to the body using a white mastic compound.

CAUTION: Door and Liftgate weatherstrip seals that use a white mastic sealant must be replaced with a new weatherstrip and any mastic must be cleaned from attachment flanges whenever the weatherstrip is removed.

CAUTION: Failure to follow these recommendations could result in damage or failure to the part and the related parts.

WEATHERSTRIP, HEADER, ROOF

REMOVAL AND INSTALLATION

HEADER WEATHERSTRIP

For Header Seal Weatherstrip service. Refer to [DIAGNOSIS AND TESTING](#) .

2021 ACCESSORIES AND BODY, CAB

Body Control Module (BCM) - Communication Diagnostic Procedure & Body Verification Test - Gladiator

STANDARD PROCEDURE

COMMUNICATION DIAGNOSTIC PROCEDURE

1. CHECK FOR POSSIBLE CAUSES

1. This Communication Diagnostic Procedure is intended to provide the technician with a common starting point.

NOTE: For an in-depth explanation of the Controller Area Network (CAN) Bus system operation. Refer to COMMUNICATION, DESCRIPTION AND OPERATION .

NOTE: For intermittent communication issues, or if multiple communication related DTCs are set in other Electronic Control Modules (ECUs), check the suspected ECU power and ground circuits, including at the body sheet-metal, for loose or poor connections. Performing a load test on these circuits will verify the circuit is capable of carrying the amperage needed to perform properly, along with confirming that excessive resistance does not exist in the circuit(s) being tested. For additional information on CIRCUIT LOAD TESTING PROCEDURES. Refer to STANDARD PROCEDURE . The vehicle communication systems may be diagnosed with the Mopar Scope. Refer to DIAGNOSIS AND TESTING .

2. Check the Battery for proper State of Charge (SOC) and the Charging System for proper operation. Refer to the appropriate service information .
3. With the scan tool, check all Electronic Control Modules (ECUs) for battery and ignition voltage related DTCs and record on the repair order.
4. Check for and perform all Service Bulletins that could be related to the customer's concern.
5. Check aftermarket accessories for proper installation. (Check for improper electrical connections and fasteners that may be contacting wire harnesses)
6. With the scan tool, check all ECUs for software updates that are related to the customer's concern. Update ECU(s) as necessary.
7. Check related wire harnesses for collision related damage.

Were any problems found?

Yes

- Repair the problem as necessary.
- With the scan tool, erase DTCs from the related ECUs and perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to STANDARD PROCEDURE.

No

- Go To 2

2. CHECK ELECTRONIC CONTROL MODULES FOR VEHICLE CONFIGURATION DTCS

NOTE:

A Configuration DTC indicates that an ECU is not programmed with information that is specific to the vehicle (VIN, mileage, etc.). If an ECU is not configured properly, serial data communication failures may exist. The following list includes, but is not limited to, DTC descriptors that indicate a Configuration DTC.

- ECU Configuration Mismatch - Not Configured
- ECU Unable To Configure
- Implausible/Missing ECU Network Configuration Data
- Implausible/Missing Vehicle Configuration Data
- Implausible Vehicle Configuration
- Incorrect Variant/Configuration
- PROXI Not Programmed (If applicable)
- Restore Vehicle Configuration
- Vehicle Configuration Mismatch
- Vehicle Configuration Not Programmed

TYPES OF CAN BUS FAULTS	
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/offending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/offending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

NOTE:

A Vehicle Scan Report can be helpful if online/phone assistance is needed.

1. With the scan tool, generate a Vehicle Scan Report and record on the repair order.
2. With the scan tool, check all ECUs for Configuration DTCs.

Are any Configuration DTCs set?

Yes

- Configure the ECU(s) as necessary in accordance with the Service Information.
- Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

No

- Go To [3](#)

3. CHECK ELECTRONIC CONTROL MODULES FOR ACTIVE COMMUNICATION RELATED DTCS

1. Refer to the scan tool DTCS.

Are any Communication related DTCS active?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK ACTIVE DTCS

1. Refer to the scan tool DTCS.

NOTE: Diagnose Lost Communication DTCS (not to be confused with CAN Bus Off or Can Bus Performance DTCS) before diagnosing other CAN related DTCS.

Which type of Communication DTC is active?

Lost Communication

- Go To [7](#)

Implausible Data, Implausible Signal, Missing Message or Invalid Data

- Go To [9](#)

5. CHECK STORED DTCS

1. Refer to the scan tool DTCS.

NOTE: Diagnose all Lost Communication DTCS before diagnosing other CAN related DTCS.

Which type of Communication DTC is stored?

Lost Communication

- Perform the STORED LOST COMMUNICATION DTCS procedure. Refer to [DIAGNOSIS AND TESTING](#) . The vehicle communication systems may be diagnosed with the Mopar Scope. Refer to [DIAGNOSIS AND TESTING](#) .

Implausible Data, Implausible Signal, Missing Message or Invalid Data

- Go To [6](#)

6. CHECK THE 'SENDING CONTROL MODULE' FOR DTCS

NOTE: The 'Sending Control Module' is the ECU that the Implausible Data, Implausible Signal, Missing Message or Invalid Data is set against. Below is a list of some items (depending on vehicle configuration) a 'Sending Control Module' may provide as a bussed out to one or more "Reporting Control Module".

- **Sensors**
 - Adjustable Pedal
 - Air Temperature

- **Battery**
- **Blind Spot**
- **Crankshaft**
- **Impact**
- **Park Assist**
- **Passive Entry**
- **Rain**
- **Ride Height**
- **Seat**
- **Sun**
- **Tire Pressure**
- **Wheel Speed**
- **Switches**
 - **Audio**
 - **Brake / Stop Lamp**
 - **Door Ajar**
 - **Hazard**
 - **Heated**
 - **Hood**
 - **Ignition**
 - **Lighting**
 - **Multifunction**
 - **Power Seat**
 - **PRNDL**
 - **SOS Console**
 - **Speed Control**

TYPES OF CAN BUS FAULTS	
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/offending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/offending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

1. Refer to the scan tool DTCs.

Are any DTCs set in the 'Sending Control Module'?

Yes

- Refer to the appropriate diagnostic procedure.

No

- Go To [11](#)

7. CHECK FOR MULTIPLE LOST COMMUNICATION DTCS

1. Refer to the scan tool DTCS.

Choose the scenario that best describes the condition of the vehicle from the list below:

One ECU is reporting a Lost Communication DTC against a single ECU.

- Go To [8](#)

Multiple ECUs are reporting a Lost Communication DTC against a single ECU.

- Perform the NO RESPONSE or NO RESPONSE FROM ECU diagnostic procedure for the ECU that is not communicating. Refer to [DIAGNOSIS AND TESTING](#) . The vehicle communication systems may be diagnosed with the Mopar Scope. Refer to [DIAGNOSIS AND TESTING](#) .

8. CONFIRM THE TYPE OF LOST COMMUNICATION

NOTE:

Some Lost Communication DTC's may set by a "Reporting Control Module" when it does not receive a message or signal from the "Sending Control Module" when both ECUs are actively communicating on the same network. Below is a list of some items (depending on vehicle configuration) a 'Sending Control Module' may provide as a bussed out to one or more "Reporting Control Module".

- **Sensors**
 - Adjustable Pedal
 - Air Temperature
 - Battery
 - Blind Spot
 - Crankshaft
 - Impact
 - Park Assist
 - Passive Entry
 - Rain
 - Ride Height
 - Seat
 - Sun
 - Tire Pressure
 - Wheel Speed
- **Switches**
 - Audio
 - Brake / Stop Lamp
 - Door Ajar
 - Hazard
 - Heated

- Hood
- Ignition
- Lighting
- Multifunction
- Power Seat
- PRNDL
- SOS Console
- Speed Control

NOTE: **Reminder some ECUs are connected to multiple networks.**

1. Using the Service Information, refer to the wiring information and **STOP** the "Sending Control Module" from communicating on the associated CAN. Disconnecting the ECU or removing the power being fed to the ECU, for example, will **STOP** an ECU from communicating on a CAN.
2. Turn the ignition off for 5 seconds.
3. Turn the ignition on.
4. With the scan tool, check for all communication DTCs.
5. Confirm the "Sending Control Module" is no longer communicating with the scan tool.
6. Confirm multiple modules show a lost communication DTC against the "Sending Control Module".

Choose the scenario that best describes the condition of the vehicle from the list below:

Multiple ECUs are reporting a Lost Communication DTC against the "Sending Control Module"

- Turn the ignition off.
- Restore communication to the "Sending Control Module".
- Turn the ignition on.
- With the scan tool, confirm communication with the "Sending Control Module" on the associated CAN has returned.
- With the scan tool, erase DTCs.
- With the scan tool read the "Sending Control Module" for DTCs and perform the necessary repairs for any DTCs (active, stored, or pending) according to Service Information before proceeding.
- **IF** the "Sending Control Module" has no DTCs (active, stored, or pending) that are current or ongoing, then replace the " **Sending Control Module** " in accordance with Service Information.
- Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Only the "Reporting Control Module" is reporting a Lost Communication DTC against the "Sending Control Module"

- Turn the ignition off.
- Restore communication to the "Sending Control Module".
- Turn the ignition on.
- With the scan tool, confirm communication with the "Sending Control Module" on the associated CAN has returned.
- With the scan tool, erase DTCs.

- With the scan tool read the "Sending Control Module" for DTCs and perform the necessary repairs for any DTCs (active, stored, or pending) according to Service Information before proceeding.
- At this time, there is no indication of an issue with the "Sending Control Module". **IF** the "Sending Control Module" has no DTCs (active, stored, or pending) that are current or ongoing, then replace the " **Reporting Control Module** " in accordance with Service Information.
- Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

9. CHECK THE 'SENDING CONTROL MODULE' FOR DTCs

NOTE:

The 'Sending Control Module' is the ECU that the Implausible Data, Implausible Signal, Missing Message or Invalid Data DTC is set against. Below is a list of some items (depending on vehicle configuration) a 'Sending Control Module' may provide as a bus connected to one or more 'Reporting Control Module'.

- **Sensors**
 - Adjustable Pedal
 - Air Temperature
 - Battery
 - Blind Spot
 - Crankshaft
 - Impact
 - Park Assist
 - Passive Entry
 - Rain
 - Ride Height
 - Seat
 - Sun
 - Tire Pressure
 - Wheel Speed
- **Switches**
 - Audio
 - Brake / Stop Lamp
 - Door Ajar
 - Hazard
 - Heated
 - Hood
 - Ignition
 - Lighting
 - Multifunction
 - Power Seat
 - PRNDL
 - SOS Console
 - Speed Control

TYPES OF CAN BUS FAULTS	
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/offending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/offending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

1. Refer to the scan tool DTCs.
2. With the scan tool, check the 'Sending Control Module' for non-U-code DTCs that are related to the U-code that is set, or related to the customer's concern if the U-code DTC name is not clear about which signal is faulted.

Is a related non U-code DTC set in the 'Sending Control Module'.

Yes

- Refer to the appropriate diagnostic procedure.

No

- Go To [10](#)

10. CHECK OTHER ELECTRONIC CONTROL MODULES FOR RELATED NON U-CODE DTCs

NOTE:

IMPORTANT: Some ECUs simply pass information from one ECU to the other. In some cases, a U-code DTC may be set that implicates the "pass-through" ECU that sent the information. For example, if an Engine Coolant Temperature (ECT) Sensor DTC is set in the Powertrain Control Module (PCM), the HVAC Module may set an "Implausible Data from BCM" DTC because the BCM is the ECU that normally passes that information from the PCM to the HVAC Module. However, the BCM may not set any DTCs related to the faulted ECT Sensor because the BCM does not use the ECT information. In this case, the PCM ECT DTC should be diagnosed before the Implausible Data DTC. If you suspect a scenario like this, diagnose the non U-code DTC(s) before diagnosing any Implausible Data, Implausible Signal, Missing Message or Invalid Data DTCs. Below are some further examples of different sensors and switches:

- **Sensors**
 - Adjustable Pedal
 - Air Temperature
 - Battery
 - Blind Spot
 - Crankshaft
 - Impact

- Park Assist
- Passive Entry
- Rain
- Ride Height
- Seat
- Sun
- Tire Pressure
- Wheel Speed
- Switches
 - Audio
 - Brake / Stop Lamp
 - Door Ajar
 - Hazard
 - Heated
 - Hood
 - Ignition
 - Lighting
 - Multifunction
 - Power Seat
 - PRNDL
 - SOS Console
 - Speed Control

1. With the scan tool, check all other ECUs for non-U-code DTCs that are related to the U-code that is set, or related to the customer's concern if the U-code DTC name is not clear about which signal is faulted.

Is a related non U-code DTC set in another ECU?

Yes

- Diagnose the related DTC. Refer to the appropriate Diagnostic Procedure. The vehicle communication systems may be diagnosed with the Mopar Scope. Refer to **DIAGNOSIS AND TESTING**.

No

- Replace the 'Sending Control Module' in accordance with the Service Information.
- Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

11. CHECK THE 'SENDING CONTROL MODULE' RELATED WIRE HARNESS CONNECTIONS

1. Disconnect all 'Sending Control Module' related wire harness connectors.
2. Disconnect all related in-line wire harness connections (if equipped).
3. Inspect wire harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks
 - Corrosion
 - Signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

4. Connect all 'Sending Control Module' related wire harness connectors. Be certain that all wire harness connectors are fully seated and the connector locks are fully engaged.
5. Connect all in-line wire harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. With the scan tool, erase DTCs.
7. Operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- If there is a history of this DTC setting multiple times, replace the 'Sending Control Module' in accordance with the Service Information.
- Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

No

- Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.
- Test Complete.

BODY VERIFICATION TEST

Perform the Body Verification Test

1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
2. Make sure all accessories are turned off.
3. Make sure the battery is fully charged.
4. Turn the ignition on.
5. With the scan tool, record and erase Diagnostic Trouble Codes (DTC)s from all modules.
6. If any repairs were performed to the Radio Frequency (RF-Hub) system, with the scan tool, select "Diagnostic Procedures", "Reset ECU", "RFH" and perform the routine.
7. If an electronic control module was replaced, select the applicable module from the scan tool. If the module has programmable features, program as necessary.
8. **Export Only:** If the Intrusion Transceiver Module (ITM) or Siren was replaced, select the ITM from the scan tool and perform the applicable replacement procedure.
9. Turn the ignition off, wait 10 seconds, and then turn the ignition on.
10. Operate all functions of the system that caused the original concern.
11. If a power window repair or module replacement was completed, perform the following:
 - De-normalize the module by lowering the window all the way down and stall it for two seconds.

- Press and release the down switch once again.
- Operate the motor to the full up position and stall it for two seconds.

12. With the scan tool, view all the modules and check for DTCs.

Are DTCs present in any of the modules or is the original condition still present?

Yes

- The repair is not complete. Perform the appropriate diagnostic procedure for the DTC or symptom that is still present.

No

- The repair is complete.
-

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Body Control Module (BCM) - Diagnostic Code Index - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B10B3-12</u>	CABIN HEATER 1 CONTROL-CIRCUIT SHORT TO BATTERY
<u>B10B3-14</u>	CABIN HEATER 1 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN
<u>B10B7-12</u>	CABIN HEATER 2 CONTROL-CIRCUIT SHORT TO BATTERY
<u>B10B7-14</u>	CABIN HEATER 2 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN
<u>B10CA-12</u>	FRONT DEFROST CONTROL CIRCUIT-CIRCUIT SHORT TO BATTERY
<u>B10CA-14</u>	FRONT DEFROST CONTROL CIRCUIT-CIRCUIT SHORT TO GROUND OR OPEN
<u>B1137-12</u>	CABIN HEATER 3 CONTROL-CIRCUIT SHORT TO BATTERY
<u>B1137-14</u>	CABIN HEATER 3 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN
<u>B1208-11</u>	ANTI-THEFT INDICATOR-CIRCUIT SHORT TO GROUND
<u>B1208-15</u>	ANTI-THEFT INDICATOR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1609-11</u>	PANEL DIMMER INPUT-CIRCUIT SHORT TO GROUND
<u>B1609-15</u>	PANEL DIMMER INPUT-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B161E-11</u>	READING LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B162A-11</u>	LEFT LOW BEAM CONTROL-CIRCUIT SHORT TO GROUND
<u>B162A-15</u>	LEFT LOW BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B162E-11</u>	RIGHT LOW BEAM CONTROL-CIRCUIT SHORT TO GROUND
<u>B162E-15</u>	RIGHT LOW BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1632-11</u>	LEFT HIGH BEAM CONTROL-CIRCUIT SHORT TO GROUND
<u>B1632-15</u>	LEFT HIGH BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1636-11</u>	RIGHT HIGH BEAM CONTROL-CIRCUIT SHORT TO GROUND
<u>B1636-15</u>	RIGHT HIGH BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B163A-11</u>	FRONT LEFT TURN LAMP CONTROL - CIRCUIT SHORT TO GROUND
<u>B163A-15</u>	FRONT LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - HALOGEN LAMPS
<u>B163A-15</u>	FRONT LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - LED LAMPS
<u>B163E-11</u>	FRONT RIGHT TURN LAMP CONTROL - CIRCUIT SHORT TO GROUND
<u>B163E-15</u>	FRONT RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - HALOGEN LAMPS
<u>B163E-15</u>	FRONT RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - LED LAMPS
<u>B1642-11</u>	REAR LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B1642-15</u>	REAR LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1646-11</u>	REAR RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B1646-15</u>	REAR RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B165C-11</u>	RIGHT SIGNATURE LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B165D-11</u>	LEFT SIGNATURE LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B168E-11</u>	FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND
<u>B168E-15</u>	FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B168E-2A</u>	FRONT FOG LAMP SWITCH-STUCK

DTC	Description
<u>B16AF-11</u>	LEFT STOP LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16AF-15</u>	LEFT STOP LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16B3-11</u>	RIGHT STOP LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16B3-15</u>	RIGHT STOP LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16B7-11</u>	CENTER STOP LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16B7-15</u>	CENTER STOP LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16CF-11</u>	LEFT DRL LAMP CONTROL - CIRCUIT SHORT TO GROUND
<u>B16CF-15</u>	LEFT DRL LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16D3-11</u>	RIGHT DRL LAMP CONTROL - CIRCUIT SHORT TO GROUND
<u>B16D3-15</u>	RIGHT DRL LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16D7-11</u>	LEFT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO GROUND
<u>B16D7-15</u>	LEFT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16DF-11</u>	RIGHT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO GROUND
<u>B16DF-15</u>	RIGHT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16E7-11</u>	LICENSE PLATE LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16E7-15</u>	LICENSE PLATE LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16EF-11</u>	LEFT PARK LAMP 1 CONTROL-CIRCUIT SHORT TO GROUND
<u>B16F3-11</u>	RIGHT PARK LAMP 1 CONTROL-CIRCUIT SHORT TO GROUND
<u>B16F7-11</u>	FRONT LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16F7-15</u>	FRONT LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16FB-11</u>	FRONT RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16FB-15</u>	FRONT RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B16FF-11</u>	REAR LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B16FF-15</u>	REAR LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1703-11</u>	REAR RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B1703-15</u>	REAR RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1707-11</u>	LEFT REVERSE LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B1707-15</u>	LEFT REVERSE LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B170B-11</u>	RIGHT REVERSE LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B170B-15</u>	RIGHT REVERSE LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1751-11</u>	COURTESY LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B177A-11</u>	LEFT FRONT LAMP DIAGNOSTIC LINE-CIRCUIT SHORT TO GROUND
<u>B177B-11</u>	RIGHT FRONT LAMP DIAGNOSTIC LINE-CIRCUIT SHORT TO GROUND
<u>B178E-11</u>	HEADLAMP SWITCH INPUT-CIRCUIT SHORT TO GROUND
<u>B178E-15</u>	HEADLAMP SWITCH INPUT-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1792-11</u>	LEFT REAR LAMP DIAGNOSTIC LINE - CIRCUIT SHORT TO GROUND
<u>B1793-11</u>	RIGHT REAR LAMP DIAGNOSTIC LINE - CIRCUIT SHORT TO GROUND
<u>B17A0-2A</u>	REAR FOG LAMP SWITCH CIRCUIT STUCK-STUCK
<u>B17AD-12</u>	REAR LEFT TRAILER TURN LAMP CONTROL - CIRCUIT SHORT TO BATTERY
<u>B17B1-12</u>	REAR RIGHT TRAILER TURN LAMP CONTROL - CIRCUIT SHORT TO BATTERY
<u>B17BC-11</u>	LEFT SIDEMARKER LAMP CONTROL-CIRCUIT SHORT TO GROUND

DTC	Description
<u>B17C1-11</u>	RIGHT SIDEMARKER LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B17C5-12</u>	TRAILER TOW REVERSE LAMP CONTROL - CIRCUIT SHORT TO BATTERY
<u>B17F4-11</u>	LEFT MIRROR SIGNAL LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B17F5-11</u>	RIGHT MIRROR SIGNAL LAMP CONTROL-CIRCUIT SHORT TO GROUND
<u>B17F6-12</u>	TRAILER TAILLAMP CONTROL - CIRCUIT SHORT TO BATTERY
<u>B17FF-11</u>	AMBIENT CABIN LIGHT DIMMER SWITCH - CIRCUIT SHORT TO GROUND
<u>B17FF-15</u>	AMBIENT CABIN LIGHT DIMMER SWITCH - CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1800-11</u>	DRIVER DOOR LOCK-UNLOCK SWITCH-CIRCUIT SHORT TO GROUND
<u>B1805-11</u>	PASSENGER DOOR LOCK-UNLOCK SWITCH-CIRCUIT SHORT TO GROUND
<u>B180F-11</u>	DRIVER DOOR AJAR - CIRCUIT SHORT TO GROUND
<u>B180F-15</u>	DRIVER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1812-11</u>	PASSENGER DOOR AJAR-CIRCUIT SHORT TO GROUND
<u>B1812-15</u>	PASSENGER DOOR AJAR - CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1815-11</u>	REAR DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND
<u>B1815-15</u>	REAR DRIVER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1818-11</u>	REAR PASSENGER DOOR AJAR-CIRCUIT SHORT TO GROUND
<u>B1818-15</u>	REAR PASSENGER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B181E-13</u>	HOOD AJAR INPUT-CIRCUIT OPEN
<u>B182C-11</u>	ALL DOOR LOCK CONTROL-CIRCUIT SHORT TO GROUND
<u>B182C-12</u>	ALL DOOR LOCK CONTROL-CIRCUIT SHORT TO BATTERY
<u>B182C-13</u>	ALL DOOR LOCK CONTROL-CIRCUIT OPEN
<u>B1830-11</u>	ALL DOORS UNLOCK CONTROL-CIRCUIT SHORT TO GROUND
<u>B1830-12</u>	ALL DOORS UNLOCK CONTROL-CIRCUIT SHORT TO BATTERY
<u>B1834-11</u>	DRIVER DOOR UNLOCK CONTROL-CIRCUIT SHORT TO GROUND
<u>B1834-12</u>	DRIVER DOOR UNLOCK CONTROL-CIRCUIT SHORT TO BATTERY
<u>B18AA-11</u>	TRUNK-GATE UNLOCK CONTROL 1-CIRCUIT SHORT TO GROUND
<u>B18CF-11</u>	SECONDARY DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND
<u>B18CF-15</u>	SECONDARY DRIVER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1E01-11</u>	MIRROR POWER SUPPLY-CIRCUIT SHORT TO GROUND
<u>B1E01-15</u>	MIRROR POWER SUPPLY-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B1E72-11</u>	B1E72-11 - POWER INVERTER ENABLE CONTROL-CIRCUIT SHORT TO GROUND-110V
<u>B2103-11</u>	IGNITION RUN/START 1 CONTROL-CIRCUIT SHORT TO GROUND
<u>B2103-15</u>	IGNITION RUN/START 1 CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B2119-11</u>	IGNITION RUN/ACC/SPAD CONTROL-CIRCUIT SHORT TO GROUND
<u>B2119-15</u>	IGNITION RUN/ACC/SPAD CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B2121-11</u>	IGNITION RUN CONTROL 1-CIRCUIT SHORT TO GROUND
<u>B2121-15</u>	IGNITION RUN CONTROL 1-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B212E-11</u>	IGNITION RUN/ACC CONTROL-CIRCUIT SHORT TO GROUND
<u>B212E-15</u>	IGNITION RUN/ACC CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B2143-11</u>	UGDO ENABLE CONTROL-CIRCUIT SHORT TO GROUND
<u>B2183-11</u>	IGNITION UNLOCK RUN-START CONTROL-CIRCUIT SHORT TO GROUND

DTC	Description
<u>B2193-00</u>	INTELLIGENT BATTERY SENSOR INTERNAL
<u>B2199-16</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B2199-17</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B21F8-13</u>	EXTERIOR LIGHTING POWER SUPPLY INPUT 1-CIRCUIT OPEN
<u>B21F9-13</u>	EXTERIOR LIGHTING POWER SUPPLY INPUT 2-CIRCUIT OPEN
<u>B2204-4A</u>	ECU CONFIGURATION MISMATCH-INCORRECT COMPONENT INSTALLED
<u>B2204-56</u>	ECU CONFIGURATION MISMATCH-INVALID-INCOMPATIBLE CONFIGURATION
<u>B2206-00</u>	CURRENT VIN MISSING/MISMATCH
<u>B222C-00</u>	VEHICLE CONFIGURATION NOT PROGRAMMED
<u>B225C-00</u>	COMPASS MODULE INTERNAL
<u>B2267-00</u>	INTERIOR REAR VIEW MIRROR MODULE INTERNAL
<u>B2303-11</u>	WIPER PARK SWITCH INPUT-CIRCUIT SHORT TO GROUND
<u>B2303-13</u>	WIPER PARK SWITCH INPUT-CIRCUIT OPEN
<u>B2312-11</u>	WIPER ON/OFF CONTROL-CIRCUIT SHORT TO GROUND
<u>B2312-15</u>	WIPER ON/OFF CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B2316-11</u>	WIPER HIGH/LOW CONTROL-CIRCUIT SHORT TO GROUND
<u>B2316-15</u>	WIPER HIGH/LOW CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B2335-11</u>	HORN CONTROL-CIRCUIT SHORT TO GROUND
<u>B2335-15</u>	HORN CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>B233D-11</u>	FRONT/REAR WASHER MOTOR (+) CONTROL-CIRCUIT SHORT TO GROUND
<u>B23B8-2A</u>	BRAKE PEDAL SWITCH-STUCK
<u>B259F-11</u>	TRUNK/LIFTGATE LOCK CONTROL CIRCUIT-CIRCUIT SHORT TO GROUND
<u>C1006-13</u>	BRAKE FLUID LEVEL INPUT-CIRCUIT OPEN
<u>P0070-11</u>	AMBIENT AIR TEMPERATURE SENSOR CIRCUIT-CIRCUIT SHORT TO GROUND
<u>P0070-15</u>	AMBIENT AIR TEMPERATURE SENSOR CIRCUIT-CIRCUIT SHORT TO BATTERY OR OPEN
<u>P0460-11</u>	FUEL LEVEL SENSOR 1 - CIRCUIT SHORT TO GROUND
<u>P0460-15</u>	FUEL LEVEL SENSOR 1 - CIRCUIT SHORT TO BATTERY OR OPEN
<u>P1276-12</u>	STARTER CONTROL 2-CIRCUIT SHORT TO BATTERY
<u>P1276-14</u>	STARTER CONTROL 2-CIRCUIT SHORT TO GROUND OR OPEN
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0010-00</u>	CAN INTERIOR BUS
<u>U0011-00</u>	CAN INTERIOR BUS OFF PERFORMANCE
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0155-00</u>	LOST COMMUNICATION WITH CLUSTER-CCN
<u>U0161-00</u>	LOST COMMUNICATION WITH COMPASS MODULE
<u>U0164-00</u>	LOST COMMUNICATION WITH HVAC CONTROL MODULE
<u>U0167-00</u>	LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE
<u>U0184-00</u>	LOST COMMUNICATION WITH RADIO
<u>U0206-00</u>	U0206-00 LOST COMMUNICATION WITH POWER TOP CONTROL MODULE

DTC	Description
<u>U0212-00</u>	LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE
<u>U0213-00</u>	LOST COMMUNICATION WITH INTERIOR MIRROR CONTROL MODULE "A"-
<u>U1008-00</u>	LIN 1 BUS
<u>U1009-00</u>	LIN 2 BUS
<u>U1045-00</u>	LIN 3 BUS
<u>U112D-00</u>	LOST COMMUNICATION WITH EVIC STEERING WHEEL SWITCHES
<u>U113B-00</u>	LOST COMMUNICATION WITH SWITCH BANK MODULE
<u>U113E-00</u>	LOST COMMUNICATION WITH INTELLIGENT BATTERY SENSOR
<u>U114F-00</u>	LOST COMMUNICATION WITH LIN OVERHEAD CONSOLE
<u>U1191-00</u>	LOST COMMUNICATION WITH SWITCH BANK MODULE 2
<u>U11B9-00</u>	LOST COMMUNICATION WITH RF HUB
<u>U1433-23</u>	IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL STUCK LOW
<u>U1433-24</u>	IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL STUCK HIGH
<u>U1514-64</u>	ENGINE CONTROLLER SECRET CODE - SIGNAL PLAUSIBILITY FAILURE
<u>U1514-87</u>	ENGINE CONTROLLER SECRET CODE - MISSING MESSAGE
<u>U1515-62</u>	STEERING COLUMN LOCK SECRET CODE - SIGNAL COMPARE FAILURE
<u>U1515-64</u>	STEERING COLUMN LOCK SECRET CODE - SIGNAL PLAUSIBILITY FAILURE
<u>U1515-87</u>	STEERING COLUMN LOCK SECRET CODE - MISSING MESSAGE
<u>U1516-64</u>	RF HUB SECRET CODE - SIGNAL PLAUSIBILITY FAILURE
<u>U1516-87</u>	RF HUB SECRET CODE - MISSING MESSAGE

2021 ACCESSORIES AND BODY, CAB

BODY CONTROL MODULE (BCM) - DTCS B10B3-12 TO B168E-2A - Gladiator

DTC TROUBLESHOOTING

B10B3-12-CABIN HEATER 1 CONTROL-CIRCUIT SHORT TO BATTERY

For a complete CABIN HEATER SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION - RELAYS

In diesel applications there are three Positive Temperature Coefficient (PTC) Relays, located in the Power Distribution Center (PDC) Assembly, are used for the PTC Cabin Heater System. The PTC Relays are used to supply fused battery voltage directly to the heating elements of the Cabin Heater. When the Body Control Module (BCM) receives a PTC Cabin Heater System activation CAN Bus message from the Powertrain Control Module (PCM), the BCM provides a ground signal, through the PTC Relay Control circuits, to activate the PTC Relays. When the PTC Relays are activated, a voltage output is sent to the Cabin Heater through the Fused Cabin Heater Supply circuits.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the PTC 1 Relay Output transitions from Off to On and the Body Control Module (BCM) detects a short to voltage on the PTC 1 Relay Control circuit for greater than 20 milliseconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

POSSIBLE CAUSES

Possible Causes
PTC 1 RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
PTC 1 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. SUBSTITUTE THE PTC 1 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK FOR VOLTAGE ON THE (K360) PTC 1 RELAY CONTROL CIRCUIT AT THE PTC 1 RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K360) PTC 1 RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B10B3-14-CABIN HEATER 1 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN

For a complete CABIN HEATER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION - RELAYS

In diesel applications there are three Positive Temperature Coefficient (PTC) Relays, located in the Power Distribution Center (PDC) Assembly, are used for the PTC Cabin Heater System. The PTC Relays are used to supply fused battery voltage directly to the heating elements of the Cabin Heater. When the Body Control Module (BCM) receives a PTC Cabin Heater System activation CAN Bus message from the Powertrain Control Module (PCM), the BCM provides a ground signal, through the PTC Relay Control circuits, to activate the PTC Relays. When the PTC Relays are activated, a voltage output is sent to the Cabin Heater through the Fused Cabin Heater Supply circuits.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) PTC 1 Relay Output is Off and the BCM detects less than 1.5 volts on the PTC 1 Relay Control circuit for greater than one second.

POSSIBLE CAUSES

Possible Causes
PTC 1 RELAY CONTROL CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
OPEN FUSE
PTC 1 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- **Only DTC B10B3-14 is Active:** Go To [2](#)
- **DTCs B10B3-14, B10B7-14 and B1137-14 are Active:** Go To [7](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. SUBSTITUTE THE PTC 1 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K360) PTC 1 RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE PTC 1 RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.

3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K360) PTC 1 RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

5. CHECK THE (K360) PTC 1 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BETWEEN THE BCM AND THE PTC 1 RELAY TERMINAL

1. The ignition must be off when checking the resistance of a circuit.

2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the Power Distribution Center (PDC) Assembly.
4. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [6](#)

No

- Go To [2](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K360) PTC 1 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

7. CHECK FUSE 1 (50A) FOR AN OPEN

NOTE: When removing fuses from the PDC Assembly, do not rock or wiggle the fuse sideways during removal. Lift the fuse upward, using fingers or suitable pliers, at the middle of the fuse body and inspect the fuse terminals for proper contact.

1. Turn the ignition off.
2. Remove the indicated fuse from the Power Distribution Center (PDC) Assembly.

3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Install the fuse. Repair the circuit for an open or high resistance. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to **CENTER, POWER DISTRIBUTION (PDC), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

9. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B10B7-12-CABIN HEATER 2 CONTROL-CIRCUIT SHORT TO BATTERY

For a complete CABIN HEATER SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION - RELAYS

In diesel applications there are three Positive Temperature Coefficient (PTC) Relays, located in the Power Distribution Center (PDC) Assembly, are used for the PTC Cabin Heater System. The PTC Relays are used to supply fused battery voltage directly to the heating elements of the Cabin Heater. When the Body Control Module (BCM) receives a PTC Cabin Heater System activation CAN Bus message from the Powertrain Control Module (PCM), the BCM provides a ground signal, through the PTC Relay Control circuits, to activate the PTC Relays. When the PTC Relays are activated, a voltage output is sent to the Cabin Heater through the Fused Cabin Heater Supply circuits.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the PTC 2 Relay Output transitions from Off to On and the Body Control Module (BCM) detects a short to voltage on the PTC 2 Relay Control circuit for greater than 20 milliseconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

POSSIBLE CAUSES

Possible Causes
PTC 2 RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
PTC 2 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module’s internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE PTC 2 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. CHECK FOR VOLTAGE ON THE (K361) PTC 2 RELAY CONTROL CIRCUIT AT THE PTC 2 RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K361) PTC 2 RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B10B7-14-CABIN HEATER 2 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN

For a complete CABIN HEATER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION - RELAYS

In diesel applications there are three Positive Temperature Coefficient (PTC) Relays, located in the Power Distribution Center (PDC) Assembly, are used for the PTC Cabin Heater System. The PTC Relays are used to supply fused battery voltage directly to the heating elements of the Cabin Heater. When the Body Control Module (BCM) receives a PTC Cabin Heater System activation CAN Bus message from the Powertrain Control Module (PCM), the BCM provides a ground signal, through the PTC Relay Control circuits, to activate the PTC Relays. When the PTC Relays are activated, a voltage output is sent to the Cabin Heater through the Fused Cabin Heater Supply circuits.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) PTC 2 Relay Output is Off and the BCM detects less than 1.5 volts on the PTC 2 Relay Control circuit for greater than one second.

POSSIBLE CAUSES

Possible Causes
PTC 2 RELAY CONTROL CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
OPEN FUSE
PTC 2 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- **Only DTC B10B7-14 is Active:** Go To [2](#)
- **DTCs B10B3-14, B10B7-14 and B1137-14 are Active:** Go To [7](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **[STANDARD PROCEDURE](#)**.

2. SUBSTITUTE THE PTC 2 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **[BODY VERIFICATION TEST](#)**.

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K361) PTC 2 RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE PTC 2 RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K361) PTC 2 RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

5. CHECK THE (K361) PTC 2 RELAY CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE BETWEEN THE BCM AND THE PTC 2 RELAY TERMINAL

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the Power Distribution Center (PDC) Assembly.
4. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K361) PTC 2 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [8](#)

7. CHECK FUSE 2 (50A) FOR AN OPEN

NOTE: When removing fuses from the PDC Assembly, do not rock or wiggle the fuse sideways during removal. Lift the fuse upward, using fingers or suitable pliers, at the middle of the fuse body and inspect the fuse terminals for proper contact.

1. Turn the ignition off.
2. Remove the indicated fuse from the Power Distribution Center (PDC) Assembly.
3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look

for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Install the fuse. Repair the circuit for an open or high resistance. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

8. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

- Test complete.

9. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B10CA-12-FRONT DEFROST CONTROL CIRCUIT-CIRCUIT SHORT TO BATTERY

For a complete DEFOGGER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Windshield Heater Relay Output transitions from Off to On and the Body Control Module (BCM) detects a short to voltage on the Windshield Heater Relay Control circuit for greater than 20 milliseconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

POSSIBLE CAUSES

Possible Causes
WINDSHIELD HEATER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
WINDSHIELD HEATER RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. SUBSTITUTE THE WINDSHIELD HEATER RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.

3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR VOLTAGE ON THE (C902) WINDSHIELD HEATER RELAY CONTROL CIRCUIT AT THE WINDSHIELD HEATER RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (C902) WINDSHIELD HEATER RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B10CA-14-FRONT DEFROST CONTROL CIRCUIT-CIRCUIT SHORT TO GROUND OR OPEN

For a complete DEFOGGER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) Windshield Heater Relay Output is Off and the BCM detects less than 1.5 volts on the Windshield Heater Relay Control circuit for greater than one second.

POSSIBLE CAUSES

Possible Causes
WINDSHIELD HEATER RELAY CONTROL CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
OPEN FUSE
WINDSHIELD HEATER RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK FUSE F44 (10A) FOR AN OPEN

NOTE: When removing fuses from the PDC Assembly, do not rock or wiggle the fuse sideways during removal. Lift the fuse upward, using fingers or suitable pliers, at the middle of the fuse body and inspect the fuse terminals for proper contact.

1. Turn the ignition off.
2. Remove the indicated fuse from the Power Distribution Center (PDC) Assembly.
3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Install the fuse and Go To [3](#)

3. SUBSTITUTE THE WINDSHIELD HEATER RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (C902) WINDSHIELD HEATER RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE WINDSHIELD HEATER RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (C902) WINDSHIELD HEATER RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

6. CHECK THE (C902) WINDSHIELD HEATER RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BETWEEN THE BCM AND THE WINDSHIELD HEATER RELAY TERMINAL

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the Power Distribution Center (PDC) Assembly.
4. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [7](#)

No

- Go To [9](#)

7. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (C902) WINDSHIELD HEATER RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

8. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

9. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1137-12-CABIN HEATER 3 CONTROL-CIRCUIT SHORT TO BATTERY

For a complete CABIN HEATER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION - RELAYS

In diesel applications there are three Positive Temperature Coefficient (PTC) Relays, located in the Power Distribution Center (PDC) Assembly, are used for the PTC Cabin Heater System. The PTC Relays are used to supply fused battery voltage directly to the heating elements of the Cabin Heater. When the Body Control Module (BCM) receives a PTC Cabin Heater System activation CAN Bus message from the Powertrain Control Module (PCM), the BCM provides a ground signal, through the PTC Relay Control circuits, to activate the PTC Relays. When the PTC Relays are activated, a voltage output is sent to the Cabin Heater through the Fused Cabin Heater Supply circuits.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the PTC 3 Relay Output transitions from Off to On and the Body Control Module (BCM) detects a short to voltage on the PTC 3 Relay Control circuit for greater than 20 milliseconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

POSSIBLE CAUSES

Possible Causes
PTC 3 RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
PTC 3 RELAY
AUXILIARY POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. SUBSTITUTE THE PTC 3 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR VOLTAGE ON THE (K363) PTC 3 RELAY CONTROL CIRCUIT AT THE PTC 3 RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K363) PTC 3 RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to **CENTER, POWER DISTRIBUTION (PDC), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1137-14-CABIN HEATER 3 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN

For a complete CABIN HEATER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION - RELAYS

In diesel applications there are three Positive Temperature Coefficient (PTC) Relays, located in the Power Distribution Center (PDC) Assembly, are used for the PTC Cabin Heater System. The PTC Relays are used to supply fused battery voltage directly to the heating elements of the Cabin Heater. When the Body Control Module (BCM) receives a PTC Cabin Heater System activation CAN Bus message from the Powertrain Control Module (PCM), the BCM provides a ground signal, through the PTC Relay Control circuits, to activate the PTC Relays. When the PTC Relays are activated, a voltage output is sent to the Cabin Heater through the Fused Cabin Heater Supply circuits.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) PTC 3 Relay Output is Off and the BCM detects less than 1.5 volts on the PTC 3 Relay Control circuit for greater than one second.

POSSIBLE CAUSES

Possible Causes
PTC 3 RELAY CONTROL CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED TO GROUND
OPEN FUSE
PTC 3 RELAY

Possible Causes
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- **Only DTC B1137-14 is Active:** Go To [2](#)
- **DTCS B10B3-14, B10B7-14 and B1137-14 are Active:** Go To [7](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE PTC 3 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing a relay from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCS may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCS.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCS.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K363) PTC 3 RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE PTC 3 RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K363) PTC 3 RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

5. CHECK THE (K363) PTC 3 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BETWEEN THE BCM AND THE PTC 3 RELAY TERMINAL

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the Power Distribution Center (PDC) Assembly.
4. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K363) PTC 3 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Isolate the circuit by disconnecting the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

7. CHECK FUSE 3 (50A) FOR AN OPEN

NOTE: When removing fuses from the PDC Assembly, do not rock or wiggle the fuse sideways during removal. Lift the fuse upward, using fingers or suitable pliers, at the middle of the fuse body and inspect the fuse terminals for proper contact.

1. Turn the ignition off.
2. Remove the indicated fuse from the Power Distribution Center (PDC) Assembly.
3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Install the fuse. Repair the circuit for an open or high resistance. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

9. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1208-11-ANTI-THEFT INDICATOR-CIRCUIT SHORT TO GROUND

For a complete MESSAGE SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Vehicle Theft Alarm (VTA) Warning Indicator is located in the Instrument Panel Cluster (IPC). The Body Control Module (BCM) sends a voltage signal to the IPC, via the VTA Warning Indicator circuit, in order to illuminate the Anti-Theft Indicator when the following conditions are met:

- The BCM receives a Controller Area Network (CAN) message from the RF Hub (RFH) indicating all immobilizer requirements have been met.
- The ignition is off.
- The hood ajar status is set to off.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Vehicle Theft Alarm (VTA) Warning Indicator output is On and the Body Control Module (BCM) detects a short to ground on the VTA Warning Indicator circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The VTA Warning Indicator is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
VTA WARNING INDICATOR CIRCUIT SHORTED TO GROUND
INSTRUMENT PANEL CLUSTER (IPC)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE INSTRUMENT PANEL CLUSTER (IPC) FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the IPC harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Instrument Panel Cluster (IPC) in accordance with the Service Information. Refer to [MODULE, INSTRUMENT PANEL CLUSTER \(IPC\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR AND CHECK THE (G84) VTA WARNING INDICATOR CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect the all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1208-15-ANTI-THEFT INDICATOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete MESSAGE SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Vehicle Theft Alarm (VTA) Warning Indicator is located in the Instrument Panel Cluster (IPC). The Body Control Module (BCM) sends a voltage signal to the IPC, via the VTA Warning Indicator circuit, in order to illuminate the Anti-Theft Indicator when the following conditions are met:

- The BCM receives a Controller Area Network (CAN) message from the RF Hub (RFH) indicating all immobilizer requirements have been met.
- The ignition is off.
- The hood ajar status is set to off.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Vehicle Theft Alarm (VTA) Warning Indicator output is Off and the Body Control Module (BCM) detects a short to voltage on the VTA Warning Indicator circuit for greater than 180 milliseconds.

DEFAULT ACTION

- The VTA Warning Indicator is inoperative.

POSSIBLE CAUSES

Possible Causes
VTA SECURITY WARNING CIRCUIT SHORTED TO VOLTAGE INSTRUMENT PANEL CLUSTER (IPC) BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

NOTE: This DTC only detects a short to voltage. An open circuit is not supported.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE INSTRUMENT PANEL CLUSTER (IPC) HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Instrument Panel Cluster (IPC) in accordance with the Service Information. Refer to **MODULE, INSTRUMENT PANEL CLUSTER (IPC), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G84) VTA WARNING INDICATOR CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1609-11-PANEL DIMMER INPUT-CIRCUIT SHORT TO GROUND

For a complete INTERIOR LIGHTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Dimmer Switch is integral to the Headlamp Switch. The Dimmer Switch is used to control the brightness of components that receive backlighting, such as the Instrument Panel Cluster (IPC), along with other various backlit components.

The Body Control Module (BCM) supplies and monitors a 5.0 volt reference voltage to the Headlamp/Dimmer Switch, through the Panel Lamps Driver circuit or Panel Lamps Dimmer Switch MUX Signal circuit. Based on the Headlamp/Dimmer Switch position, the BCM sets and adjusts the illumination output for the various backlit components.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 50.0 Ohms, or 0.281 volts, on the Panel Lamps Driver circuit for greater than 10 seconds.

DEFAULT ACTION

- The Panel Lamps are always on.

POSSIBLE CAUSES

Possible Causes
PANEL LAMPS DRIVER CIRCUIT SHORTED TO GROUND
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE HEADLAMP SWITCH FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Headlamp Switch harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (E2) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect the all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **4**

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1609-15-PANEL DIMMER INPUT-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete INTERIOR LIGHTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Dimmer Switch is integral to the Headlamp Switch. The Dimmer Switch is used to control the brightness of components that receive backlighting, such as the Instrument Panel Cluster (IPC), along with other various backlit components.

The Body Control Module (BCM) supplies and monitors a 5.0 volt reference voltage to the Headlamp/Dimmer Switch, through the Panel Lamps Driver circuit or Panel Lamps Dimmer Switch MUX Signal circuit. Based on the Headlamp/Dimmer Switch position, the BCM sets and adjusts the illumination output for the various backlit components.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 100k Ohms, or 4.687 volts, on the Panel Lamps Driver circuit for greater than 10 seconds.

DEFAULT ACTION

- The Panel Lamps are always on.

POSSIBLE CAUSES

Possible Causes
PANEL LAMPS DIMMER SIGNAL CIRCUIT SHORTED TO VOLTAGE
PANEL LAMPS DIMMER SIGNAL CIRCUIT OPEN
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE HEADLAMP SWITCH HARNESS CONNECTOR AND CHECK THE (E2) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the all component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (E2) PANEL LAMPS DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect the all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (E2) PANEL LAMPS DRIVER CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Connect a fused jumper wire between ground and the circuit being tested at the ECU harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. With the scan tool, read the BCM DTCS.

Is DTC: B1609-11-PANEL DIMMER INPUT - CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [**SWITCH, HEADLAMP, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCS.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCS.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B161E-11-READING LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete INTERIOR LIGHTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a battery voltage output through the Reading Lamps Driver circuit to the Reading Lamps. When a Reading Lamp is activated, the Reading Lamp provides a path to ground, to the body sheet metal, and the Reading Lamp illuminates.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 10.3 amps on the Reading Lamps Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Reading Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
READING LAMPS DRIVER CIRCUIT SHORTED TO GROUND
CENTER CONSOLE LAMP
LEFT VANITY LAMP
RIGHT VANITY LAMP
REAR CARGO LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.

2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE CENTER CONSOLE LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Center Console Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Center Console Lamp in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE LEFT VANITY LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Vanity Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Left Vanity Lamp in accordance with the Service Information. Refer to [VISOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE RIGHT VANITY LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Vanity Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [5](#)

No

- Replace the Right Vanity Lamp in accordance with the Service Information. Refer to [VISOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK THE REAR CARGO LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Rear Cargo Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [6](#)

No

- Replace the Rear Cargo Lamp in accordance with the Service Information. Refer to [LAMP, CARGO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (M27) READING LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect the all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [7](#)

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B162A-11-LEFT LOW BEAM CONTROL-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a voltage signal, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right Low Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Low Beam Lamps are active and the Body Control Module (BCM) detects greater than 9.1 amps on the Left Low Beam Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the Low Beam Lamps are active and the Body Control Module (BCM) detects greater than 12.6 amps on the Left Low Beam Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Low Beam Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT LOW BEAM DRIVER CIRCUIT SHORTED TO GROUND
LEFT LOW BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE LEFT LOW BEAM LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Low Beam Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Low Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L43) LEFT LOW BEAM DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B162A-15-LEFT LOW BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a voltage signal, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right Low Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Low Beam Lamps are active and the Body Control Module (BCM) detects less than 1.0 amps on the Left Low Beam Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Low Beam Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT LOW BEAM DRIVER CIRCUIT OPEN
LEFT LOW BEAM DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT LOW BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE LEFT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L43) LEFT LOW BEAM DRIVER CIRCUIT

NOTE: **Make sure the Headlamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L43) LEFT LOW BEAM DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. CHECK THE LEFT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

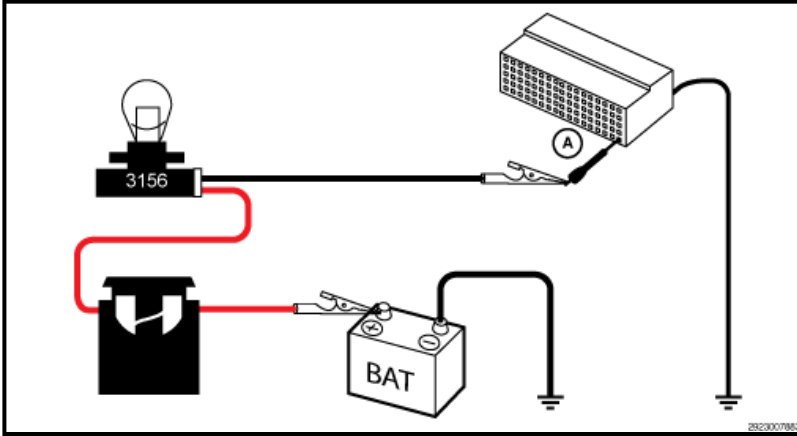
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L43) LEFT LOW BEAM DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **6**

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L43) LEFT LOW BEAM DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Left Low Beam Lamp in accordance with the Service Information. Refer to **UNIT, HEADLAMP, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **7**

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B162E-11-RIGHT LOW BEAM CONTROL-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a voltage signal, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right Low Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Low Beam Lamps are active and the Body Control Module (BCM) detects greater than 9.1 amps on the Right Low Beam Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the Low Beam Lamps are active and the Body Control Module (BCM) detects greater than 12.6 amps on the Right Low Beam Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Low Beam Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT LOW BEAM DRIVER CIRCUIT SHORTED TO GROUND
RIGHT LOW BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RIGHT LOW BEAM LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Low Beam Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Low Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L44) RIGHT LOW BEAM DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B162E-15-RIGHT LOW BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED Low Beam Lamps: When Low Beam Lamp illumination is requested, the Headlamp Switch sends an input to the Body Control Module (BCM). The BCM provides a voltage signal, through the Left and Right Low Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right Low Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Low Beam Lamps are active and the Body Control Module (BCM) detects less than 1.0 amps on the Right Low Beam Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Low Beam Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT LOW BEAM DRIVER CIRCUIT OPEN
RIGHT LOW BEAM DRIVER CIRCUIT SHORTED TO VOLTAGE

Possible Causes
GROUND CIRCUIT OPEN
RIGHT LOW BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE RIGHT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L44) RIGHT LOW BEAM DRIVER CIRCUIT

NOTE: **Make sure the Headlamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L44) RIGHT LOW BEAM DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE RIGHT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

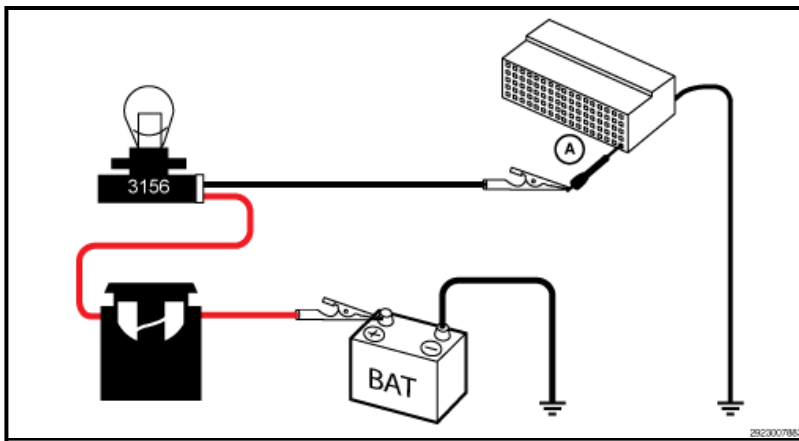
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage

drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE**.



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L44) RIGHT LOW BEAM DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L44) RIGHT LOW BEAM DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Right Low Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1632-11-LEFT HIGH BEAM CONTROL-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a voltage signal, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and

Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right High Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- **Bulb Equipped:** When the High Beam Lamps are active and the Body Control Module (BCM) detects greater than 9.1 amps on the Left High Beam Driver circuit for greater than 1.28 seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the High Beam Lamps are active and the Body Control Module (BCM) detects greater than 12.6 amps on the Left High Beam Driver circuit for greater than 1.28 seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The High Beam Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT HIGH BEAM DRIVER CIRCUIT SHORTED TO GROUND
LEFT HIGH BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**STANDARD PROCEDURE**](#) .

2. CHECK THE LEFT HIGH BEAM LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left High Beam Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left High Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L33) LEFT HIGH BEAM DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1632-15-LEFT HIGH BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a voltage signal, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and

Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right High Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the High Beam Lamps are active and the Body Control Module (BCM) detects less than 0.35 amps on the Left High Beam Driver circuit for greater than five seconds.

DEFAULT ACTION

- The High Beam Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT HIGH BEAM DRIVER CIRCUIT OPEN
LEFT HIGH BEAM DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT HIGH BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE LEFT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L33) LEFT HIGH BEAM DRIVER CIRCUIT

NOTE: Make sure the Headlamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L33) LEFT HIGH BEAM DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. CHECK THE LEFT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

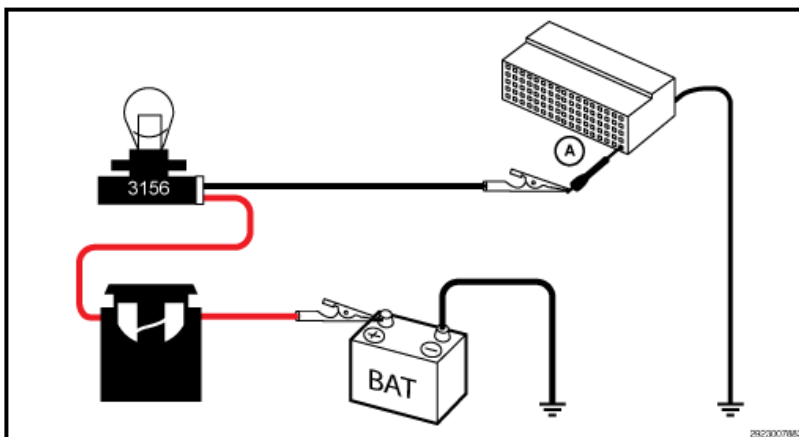
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L33) LEFT HIGH BEAM DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L33) LEFT HIGH BEAM DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Left High Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

- Test complete.

B1636-11-RIGHT HIGH BEAM CONTROL-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Incandescent High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a voltage signal, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right High Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- **Bulb Equipped:** When the High Beam Lamps are active and the Body Control Module (BCM) detects greater than 9.1 amps on the Right High Beam Driver circuit for greater than 1.28 seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the High Beam Lamps are active and the Body Control Module (BCM) detects greater than 12.6 amps on the Right High Beam Driver circuit and for greater than 1.28 seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The High Beam Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT HIGH BEAM DRIVER CIRCUIT SHORTED TO GROUND
RIGHT HIGH BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RIGHT HIGH BEAM LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right High Beam Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right High Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L34) RIGHT HIGH BEAM DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

- Test complete.

B1636-15-RIGHT HIGH BEAM CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Incandescent High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a Pulse Width Modulated (PWM) voltage, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

LED High Beam Lamps: When High Beam Lamp illumination is requested, a communication network message from the Steering Column Control Module (SCCM), or the Forward Facing Camera (FFC) Module/Driver Assistance System Module (DASM), if equipped, is sent to the Body Control Module (BCM). When this message is received, the BCM provides a voltage signal, through the Left and Right High Beam Driver circuits, to the Left and Right Front Lamp Assemblies. When this voltage signal is received, the Left and Right Front Lamp Assemblies provide the Pulse Width Modulated (PWM) voltage to activate the Left and Right High Beams. A separate ground circuit is provided to the Left and Right Front Lamp Assemblies through the wiring harness.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the High Beam Lamps are active and the Body Control Module (BCM) detects less than 0.35 amps on the Right High Beam Driver circuit for greater than five seconds.

DEFAULT ACTION

- The High Beam Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT HIGH BEAM DRIVER CIRCUIT OPEN
RIGHT HIGH BEAM DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
RIGHT HIGH BEAM LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE RIGHT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L34) RIGHT HIGH BEAM DRIVER CIRCUIT

NOTE: **Make sure the Headlamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L34) RIGHT HIGH BEAM DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE RIGHT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

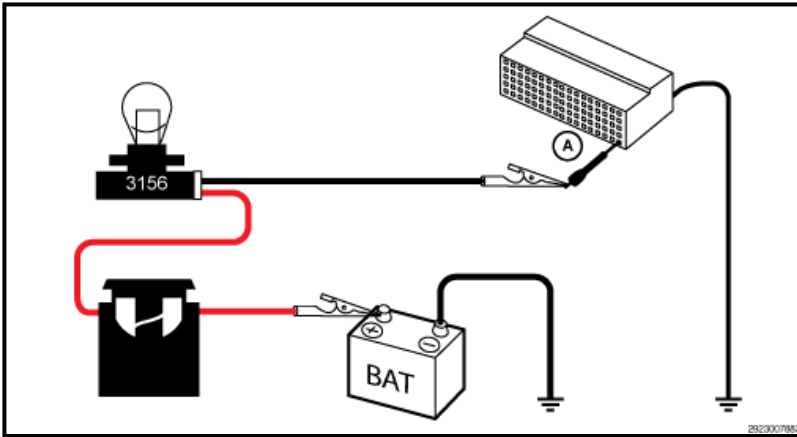
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load

testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L34) RIGHT HIGH BEAM DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L34) RIGHT HIGH BEAM DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Right High Beam Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B163A-11-FRONT LEFT TURN LAMP CONTROL - CIRCUIT SHORT TO GROUND

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Body Control Module (BCM) receives CAN Bus messages from the Steering Column Control Module (SCCM), requesting Left or Right Turn Lamp illumination. When the BCM receives this CAN Bus message, the BCM provides a Pulse Width Modulated (PWM) output, through the Left or Right Front Turn Lamp Driver circuit, to the Left or Right Front Lamp Assembly. A ground path for the Left and Right Front Lamp Assemblies is provided through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Left Turn Lamps are activated and the Body Control Module (BCM) detects a short to ground on the Left Front Turn Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Left Front Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT TURN LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT FRONT TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE.**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE LEFT FRONT TURN LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Front Turn Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Front Turn Lamp in accordance with the Service Information. Refer to [LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B163A-15-FRONT LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - HALOGEN LAMPS

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives CAN Bus messages from the Steering Column Control Module (SCCM), requesting Left or Right Turn Lamp illumination. When the BCM receives this CAN Bus message, the BCM provides a Pulse Width Modulated (PWM) output, through the Left or Right Front Turn Lamp Driver circuit, to the Left or Right Front Lamp Assembly. A ground path for the Left and Right Front Lamp Assemblies is provided through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Left Turn Lamps are activated and the Body Control Module (BCM) detects an open or short to voltage on the Left Front Turn Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Left Front Turn Lamp is always activated or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT TURN LAMP DRIVER CIRCUIT OPEN
LEFT FRONT TURN LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT FRONT TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**STANDARD PROCEDURE**](#) .

2. DISCONNECT THE LEFT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK THE VOLTAGE ON THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT

NOTE: **Make sure the Turn Lamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE LEFT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

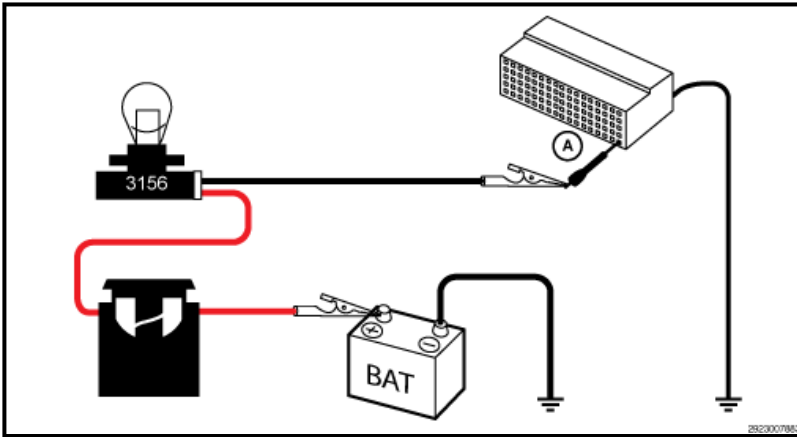
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load

testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
4. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the test light to that of a direct connection to Battery.

Is the test light illuminated and bright with the system or ECU output activated?

Yes

- Replace the Left Front Turn Lamp in accordance with the Service Information. Refer to [LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B163A-15-FRONT LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - LED LAMPS

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Left Turn Lamps are activated and the Body Control Module (BCM) receives a signal from the Left Front Lamp Assembly, through the Lighting Fault Lamp circuit, indicating a fault exists.

DEFAULT ACTION

- The Left Front Turn Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
LEFT FRONT TURN LAMP DRIVER CIRCUIT OPEN OR HIGH RESISTANCE
LEFT FRONT LIGHTING FAULT SENSE CIRCUIT OPEN OR HIGH RESISTANCE
LEFT FRONT LIGHTING FAULT SENSE CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT LAMP ASSEMBLY
BODY CONTROL MODULE (BCM)

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: After a Fault Sense circuit repair is completed, or the Lamp Assembly is replaced, the Left Turn Lamps must be activated for at least 20 cycles, in order for the DTC status to change from Active to Stored. After the DTC status has changed to Stored, the DTC can be erased.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE BCM LIGHTING FAULT SENSE VOLTAGE OUTPUT

NOTE: Make sure the Turn Lamps are off when performing this step.

1. Turn the Left Turn Lamps off.
2. Turn the ignition off.
3. Disconnect the Left Front Lamp Assembly harness connector.
4. Turn the ignition on.
5. Measure the voltage on the (L551) Left Front Lighting Fault Sense circuit at the Left Front Lamp Assembly harness connector.

Is the voltage approximately 12 volts (system voltage)?

Yes

- Go To [3](#)

No

- Go To [7](#)

3. CHECK FOR VOLTAGE ON THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT

1. Turn the Left Turn Lamps on.
2. Measure the voltage on the (L61) Left Front Turn Lamp Driver circuit at the Left Front Lamp Assembly harness connector.

Is the voltage approximately 12 volts (system voltage)?

Yes

- Go To [4](#)

No

- Go To [8](#)

4. CHECK THE LEFT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: If a load test tool needs to be created, follow the steps in Tech Tips/Engineering Notes.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

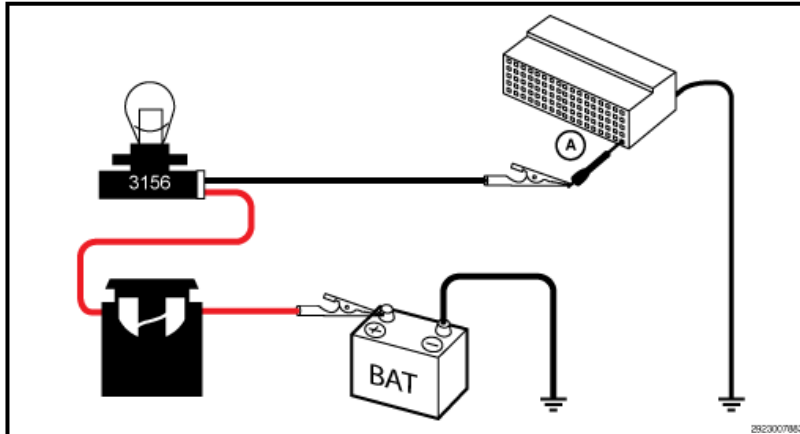
NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for

information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .

1. Turn the Turn Lamps off.
2. Turn the ignition off.
3. Connect the positive lead of the load test tool to a 12 volt circuit at the Front Lamp harness connector.
4. Connect the negative lead of the load test tool to the Ground circuit(s) at the Front Lamp harness connector (A). **Note:** refer to the diagram below.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit(s).

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the open or high resistance in the Front Lamp Ground circuit(s).
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK FOR VOLTAGE ON THE (L551) LEFT FRONT LIGHTING FAULT SENSE CIRCUIT

1. Reconnect the Left Front Lamp Assembly harness connector.
2. Turn the ignition on.
3. Turn the Left Turn Lamps on.

NOTE: To avoid damage to the terminals, insulation or weather-proof seals of the connector, use only approved connector back-probe tools when back-probing a connector.

4. Back-probing at the Left Front Lamp Assembly harness connector, measure the voltage on the (L551) Left Front Lighting Fault Sense circuit.

Does the voltage cycle from approximately 12 volts (system voltage) to below 6 volts, in sequence with Turn Lamp flashes?

Yes

- Go To [6](#)

No

- Go To [2](#)

6. CHECK THE OPERATION OF THE LEFT FRONT TURN LAMP

1. With the Left Turn Lamps on, inspect the illumination of the Left Front Turn Lamp.

Does the Left Front Turn Lamp illuminate?

Yes

- Go To [10](#)

No

- Disconnect and check the Left Front Lamp Assembly harness connector for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension. If no problems are found, replace the Left Front Lamp Assembly in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK THE (L551) LEFT FRONT LIGHTING FAULT SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Measure the resistance of the (L551) Left Front Lighting Fault Sense circuit between the Left Front Lamp Assembly harness connector and the BCM C6/F harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open or high resistance in the (L551) Left Front Lighting Fault Sense circuit.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [10](#)

8. CHECK THE (L61) LEFT FRONT TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C4/D harness connector.
3. Measure the resistance of the (L61) Left Front Turn Lamp Driver circuit between the Left Front Lamp Assembly harness connector and the BCM C4/D harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open or high resistance in the (L61) Left Front Turn Lamp Driver circuit.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [10](#)

9. CHECK THE (L551) LEFT FRONT LIGHTING FAULT SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE HARNESS CONNECTOR

NOTE: The ignition may not turn on when the BCM harness connector, containing the circuit being tested, is disconnected. Therefore, this step can help determine if the circuit being tested is shorted to another voltage circuit in any of the related harness connectors.

1. Disconnect the BCM C6/F harness connector.
2. Check for continuity between the (L551) Left Front Lighting Fault Sense circuit and all other circuits on the Left Front Lamp Assembly harness connector.
3. Check for continuity between the (L551) Left Front Lighting Fault Sense circuit and all other circuits on the BCM C6/F harness connector.

Is there continuity between the (L551) Left Front Lighting Fault Sense circuit and any other circuit(s)?

Yes

- Repair the short between the (L551) Left Front Lighting Fault Sense circuit and the circuit that has continuity.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Inspect the (L551) Left Front Lighting Fault Sense circuit for a short to voltage between the Left Front Lamp Assembly harness connector and the BCM C6/F harness connector. Repair, if needed. If no problems are found, replace the Left Front Lamp Assembly in accordance with the Service Information. Refer to [**UNIT, HEADLAMP, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

10. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B163E-11-FRONT RIGHT TURN LAMP CONTROL - CIRCUIT SHORT TO GROUND

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives CAN Bus messages from the Steering Column Control Module (SCCM), requesting Left or Right Turn Lamp illumination. When the BCM receives this CAN Bus message, the BCM provides a Pulse Width Modulated (PWM) output, through the Left or Right Front Turn Lamp Driver circuit, to the Left or Right Front Lamp Assembly. A ground path for the Left and Right Front Lamp Assemblies is provided through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Right Turn Lamps are activated and the Body Control Module (BCM) detects a short to ground on the Right Front Turn Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Right Front Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT TURN LAMP DRIVER CIRCUIT SHORTED TO GROUND
RIGHT FRONT TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE RIGHT FRONT TURN LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Front Turn Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Front Turn Lamp in accordance with the Service Information. Refer to [LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B163E-15-FRONT RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - HALOGEN LAMPS

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives CAN Bus messages from the Steering Column Control Module (SCCM), requesting Left or Right Turn Lamp illumination. When the BCM receives this CAN Bus message, the BCM provides a Pulse Width Modulated (PWM) output, through the Left or Right Front Turn Lamp Driver circuit, to the Left or Right Front Lamp Assembly. A ground path for the Left and Right Front Lamp Assemblies is provided through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Right Turn Lamps are activated and the Body Control Module (BCM) detects an open or short to voltage on the Right Front Turn Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Right Front Turn Lamp is always activated or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT TURN LAMP DRIVER CIRCUIT OPEN
RIGHT FRONT TURN LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
RIGHT FRONT TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE RIGHT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK THE VOLTAGE ON THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT

NOTE: **Make sure the Turn Lamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE RIGHT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

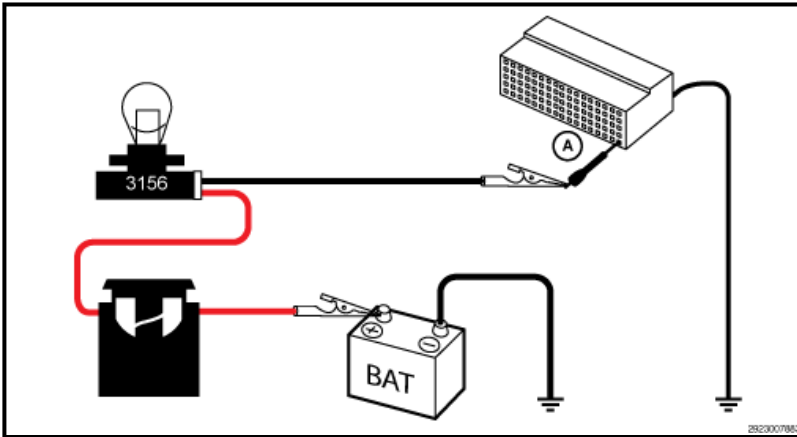
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load

testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the test light to that of a direct connection to Battery.

Is the test light illuminated and bright with the system or ECU output activated?

Yes

- Replace the Right Front Turn Lamp in accordance with the Service Information. Refer to [LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B163E-15-FRONT RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN - LED LAMPS

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Right Turn Lamps are activated and the Body Control Module (BCM) receives a signal from the Right Front Lamp Assembly, through the Lighting Fault Lamp circuit, indicating a fault exists.

DEFAULT ACTION

- The Right Front Turn Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT FRONT TURN LAMP DRIVER CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT FRONT LIGHTING FAULT SENSE CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT FRONT LIGHTING FAULT SENSE CIRCUIT SHORTED TO VOLTAGE
RIGHT FRONT LAMP ASSEMBLY
BODY CONTROL MODULE (BCM)

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: After a Fault Sense circuit repair is completed, or the Lamp Assembly is replaced, the Right Turn Lamps must be activated for at least 20 cycles, in order for the DTC status to change from Active to Stored. After the DTC status has changed to Stored, the DTC can be erased.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE BCM LIGHTING FAULT SENSE VOLTAGE OUTPUT

NOTE: Make sure the Turn Lamps are off when performing this step.

1. Turn the Right Turn Lamps off.
2. Turn the ignition off.
3. Disconnect the Right Front Lamp Assembly harness connector.
4. Turn the ignition on.
5. Measure the voltage on the (L552) Right Front Lighting Fault Sense circuit at the Right Front Lamp Assembly harness connector.

Is the voltage approximately 12 volts (system voltage)?

Yes

- Go To [3](#)

No

- Go To [7](#)

3. CHECK FOR VOLTAGE ON THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT

1. Turn the Right Turn Lamps on.
2. Measure the voltage on the (L60) Right Front Turn Lamp Driver circuit at the Right Front Lamp Assembly harness connector.

Is the voltage approximately 12 volts (system voltage)?

Yes

- Go To [4](#)

No

- Go To [8](#)

4. CHECK THE RIGHT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: If a load test tool needs to be created, follow the steps in Tech Tips/Engineering Notes.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

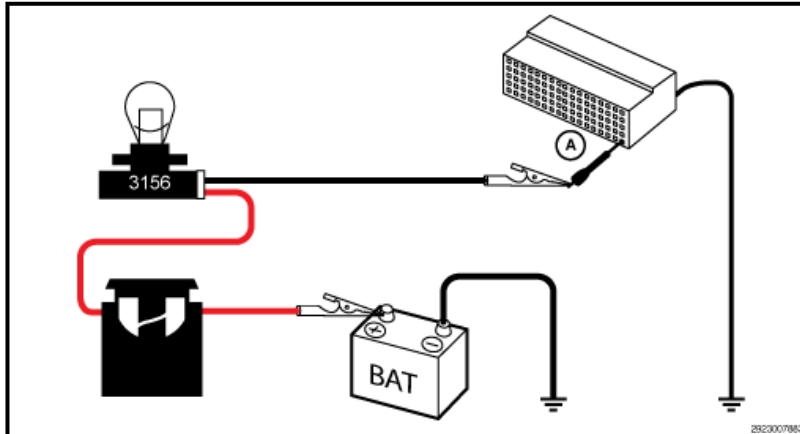
NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit

makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .

1. Turn the Turn Lamps off.
2. Turn the ignition off.
3. Connect the positive lead of the load test tool to a 12 volt circuit at the Front Lamp harness connector.
4. Connect the negative lead of the load test tool to the Ground circuit(s) at the Front Lamp harness connector (A). **Note:** refer to the diagram below.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit(s).

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the open or high resistance in the Front Lamp Ground circuit(s).
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK FOR VOLTAGE ON THE (L552) RIGHT FRONT LIGHTING FAULT SENSE CIRCUIT

1. Reconnect the Right Front Lamp Assembly harness connector.
2. Turn the ignition on.
3. Turn the Right Turn Lamps on.

NOTE: To avoid damage to the terminals, insulation or weather-proof seals of the connector, use only approved connector back-probe tools when back-probing a connector.

4. Back-probing at the Right Front Lamp Assembly harness connector, measure the voltage on the (L552) Right Front Lighting Fault Sense circuit.

Does the voltage cycle from approximately 12 volts (system voltage) to below 6 volts, in sequence with Turn Lamp flashes?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. CHECK THE OPERATION OF THE RIGHT FRONT TURN LAMP

1. With the Right Turn Lamps on, inspect the illumination of the Right Front Turn Lamp.

Does the Right Front Turn Lamp illuminate?

Yes

- Go To [10](#)

No

- Disconnect and check the Right Front Lamp Assembly harness connector for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension. If no problems are found, replace the Right Front Lamp Assembly in accordance with the Service Information. Refer to **UNIT, HEADLAMP, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

7. CHECK THE (L552) RIGHT FRONT LIGHTING FAULT SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Measure the resistance of the (L552) Right Front Lighting Fault Sense circuit between the Right Front Lamp Assembly harness connector and the BCM C6/F harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open or high resistance in the (L552) Right Front Lighting Fault Sense circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [10](#)

8. CHECK THE (L60) RIGHT FRONT TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C1/A harness connector.
3. Measure the resistance of the (L60) Right Front Turn Lamp Driver circuit between the Right Front Lamp Assembly harness connector and the BCM C1/A harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open or high resistance in the (L60) Right Front Turn Lamp Driver circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [10](#)

9. CHECK THE (L552) RIGHT FRONT LIGHTING FAULT SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE HARNESS CONNECTOR

NOTE: The ignition may not turn on when the BCM harness connector, containing the circuit being tested, is disconnected. Therefore, this step can help determine if the circuit being tested is shorted to another voltage circuit in any of the related harness connectors.

1. Disconnect the BCM C6/F harness connector.
2. Check for continuity between the (L552) Right Front Lighting Fault Sense circuit and all other circuits on the Right Front Lamp Assembly harness connector.
3. Check for continuity between the (L552) Right Front Lighting Fault Sense circuit and all other circuits on the BCM C6/F harness connector.

Is there continuity between the (L552) Right Front Lighting Fault Sense circuit and any other circuit(s)?

Yes

- Repair the short between the (L552) Right Front Lighting Fault Sense circuit and the circuit that has continuity.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Inspect the (L552) Right Front Lighting Fault Sense circuit for a short to voltage between the Right Front Lamp Assembly harness connector and the BCM C6/F harness connector. Repair, if needed. If no problems are found, replace the Right Front Lamp Assembly in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

10. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1642-11-REAR LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives CAN Bus messages from the Steering Column Control Module (SCCM), requesting Left or Right Turn Lamp illumination. A ground path for the Left and Right Tail Lamp Assemblies is provided through the wiring harness to the body sheet metal.

When requested, the BCM provides a Pulsed Width Modulated (PWM) voltage signal output to the Left or Right Rear Turn Lamp.

INCANDESCENT LAMPS: When a Left or Right Turn Lamp activation is requested, the BCM provides the PWM output @ 100Hz on the associated driver circuit.

LED LAMPS:

When a Left or Right Turn Lamp activation is requested, the BCM provides the PWM output @ 200Hz with a voltage signal between 0 - 12 volts to the selected Tail Lamp Assembly through one of the associated driver circuits (as equipped):

- Rear Turn Lamp Driver circuit
- Stop Lamp Driver circuit
- Stop/Turn Lamp Driver circuit

With the ignition on, the BCM provides a diagnostic voltage output to the Left and Right Tail Lamp Assemblies through the Left and Right Lighting Fault Sense circuits. When the Left or Right Turn Lamp is activated, the internal driver of the Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low when the Turn Lamps are illuminated. When the Turn Lamps are Off, the Lighting Fault Sense circuit voltage signal from the BCM is above 4 volts.

A failure in the Rear Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON and the voltage on the Lighting Fault Sense circuit is a constant voltage may indicate:
 - A poor connection in the harness connector.
 - The Lighting Fault Sense circuit is open.
 - The Tail Lamp Assembly ground circuit is open.
 - The Tail Lamp Assembly is inoperative.
- When the Tail Lamp Assembly harness connector is **connected** (back-probing), the Left or Right Turn Lamps are OFF and the voltage on the Lighting Fault Sense circuit is below 4 volts may indicate:
 - The Lighting Fault Sense circuit is shorted to ground.
 - The Tail Lamp Assembly is internally shorted.
 - Water or corrosion in the harness connector/terminal.
- When the Tail Lamp Assembly harness connector is **disconnected** and the voltage on Lighting Fault Sense circuit is below 4 volts (with none of the above faults are present) may indicate the BCM is not supplying the diagnostic voltage signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- **Bulb Equipped:** When the Left Turn Lamps are activated and the Body Control Module (BCM) detects greater than 7.86 amps on the Left Rear Turn Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the Left Turn Lamps are activated and the Body Control Module (BCM) detects greater than 3.0 amps on the Left Rear Turn Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Left Front Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT REAR TURN LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT REAR TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.

2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE LEFT REAR TURN LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Rear Turn Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Rear Turn Lamp in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L63) LEFT REAR TURN LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1642-15-REAR LEFT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.
- The operating range is between 9 to 16 Volts.

SET CONDITION

- **Incandescent Lamps:** When the Left Rear Turn Lamps are activated and the Body Control Module (BCM) detects less than 0.1 amperes on the Left Rear Turn Lamp Driver circuit for greater than five seconds.
- **LED Lamps:** When the Body Control Module (BCM) detects that either an internal fault or a circuit fault exists for the Left Tail Lamp Assembly.

DEFAULT ACTION

- The Left Rear Turn Lamp is always activated or inoperative.

POSSIBLE CAUSES

Possible Causes
GROUND CIRCUIT OPEN
LEFT REAR TURN LAMP DRIVER CIRCUIT OPEN OR SHORTED TO VOLTAGE (IF EQUIPPED)
LEFT STOP LAMP DRIVER CIRCUIT OPEN OR SHORTED TO VOLTAGE (IF EQUIPPED)
LEFT STOP/TURN LAMP DRIVER CIRCUIT OPEN OR SHORTED TO VOLTAGE (IF EQUIPPED)
LEFT REAR LIGHTING FAULT SENSE CIRCUIT OPEN (IF EQUIPPED)
LEFT REAR TURN LAMP (BASE LAMP)
LEFT TAIL LAMP ASSEMBLY (PREMIUM LAMP)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: **LED LAMPS ONLY:** After any Fault Sense circuit repair or replacement is completed, the Turn Lamps must be activated at least 20 cycles for the DTC status to change from Active to Stored. After the DTC status has been changed to Stored, the DTC can be erased from the internal memory of the Body Control Module (BCM).

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. With the scan tool, perform an ECU reset to the BCM, and then erase DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Record the Environmental Data.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE LEFT TAIL LAMP GROUND CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the Left Tail Lamp Assembly harness connector.
3. Measure the resistance between ground and the Tail Lamp Ground circuit at the Left Tail Lamp Assembly harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the open in the Ground circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- **Incandescent Lamps:** Go To [3](#)
- **LED Lamps:** Go To Refer to [6](#).

3. CHECK FOR VOLTAGE ON THE (L63) LEFT REAR TURN LAMP DRIVER CIRCUIT

NOTE: Make sure the Turn Lamps are off when performing this step.

1. Turn the ignition on.
2. Measure the voltage on the (L63) Left Rear Turn Lamp Driver circuit at the Left Tail Lamp Assembly harness connector.

Is there any voltage present?

Yes

- Repair the (L63) Left Rear Turn Lamp Driver circuit for an short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE BCM (L63) LEFT REAR TURN LAMP OUTPUT FOR PROPER OPERATION

1. Turn the Left Turn Lamps on.
2. Connect a 12-volt test light between ground and the (L63) Left Rear Turn Lamp Driver circuit at the Left Tail Lamp Assembly harness connector.

Does the test light illuminate on and off in sequence?

Yes

- Replace the Left Rear Turn Lamp in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE (L63) LEFT REAR TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Measure the resistance of the (L63) Left Rear Turn Lamp Driver circuit between the Left Tail Lamp Assembly harness connector and the BCM C6/F harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the (L63) Left Rear Turn Lamp Driver circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

6. CHECK FOR VOLTAGE ON THE LEFT TURN LAMP DRIVER CIRCUIT

NOTE: Depending on the vehicle, and how it is equipped, the circuit being tested may be listed as the (L63) Left Rear Turn Lamp Driver circuit, the (L52) Left Stop Lamp Driver circuit, or the (L9) Left Stop/Turn Lamp Feed circuit.

NOTE: Make sure the Turn Lamps and Stop Lamps are off when performing this step.

1. Turn the ignition on.
2. Measure the voltage on the equipped Left Turn Lamp Driver circuit at the Left Tail Lamp Assembly harness connector.

Is there any voltage present?

Yes

- Repair the equipped Left Turn Lamp Driver circuit for an short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK FOR VOLTAGE ON THE (L563) LEFT LIGHTING FAULT SENSE CIRCUIT

1. Measure the voltage on the (L563) Left Lighting Fault Sense circuit at the Left Tail Lamp Assembly harness connector.

Is the voltage below 4.0 volts?

Yes

- Go To [9](#)

No

- Go To [8](#)

8. CHECK THE EQUIPPED LEFT TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

NOTE: The circuit being tested may be listed as the (L63) Left Rear Turn Lamp Driver circuit, the (L52) Left Stop Lamp Driver circuit, or the (L9) Left Stop/Turn Feed Driver circuit.

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Measure the resistance of the equipped Left Turn Lamp Driver circuit between the Left Tail Lamp Assembly harness connector and the BCM C6/F harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the Left Turn Lamp Driver circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

9. CHECK THE (L563) LEFT LIGHTING FAULT SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Measure the resistance of the (L563) Left Lighting Fault Sense circuit between the Left Tail Lamp Assembly harness connector and the BCM C6/F harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the (L563) Left Front Lighting Fault Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [10](#)

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, perform an ECU reset to the BCM, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

- Test complete.

B1646-11-REAR RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Body Control Module (BCM) receives CAN Bus messages from the Steering Column Control Module (SCCM), requesting Left or Right Turn Lamp illumination. A ground path for the Left and Right Tail Lamp Assemblies is provided through the wiring harness to the body sheet metal.

When requested, the BCM provides a Pulsed Width Modulated (PWM) voltage signal output to the Left or Right Rear Turn Lamp.

INCANDESCENT LAMPS: When a Left or Right Turn Lamp activation is requested, the BCM provides the PWM output @ 100Hz on the associated driver circuit.

LED LAMPS:

When a Left or Right Turn Lamp activation is requested, the BCM provides the PWM output @ 200Hz with a voltage signal between 0 - 12 volts to the selected Tail Lamp Assembly through one of the associated driver circuits (as equipped):

- Rear Turn Lamp Driver circuit
- Stop Lamp Driver circuit
- Stop/Turn Lamp Driver circuit

With the ignition on, the BCM provides a diagnostic voltage output to the Left and Right Tail Lamp Assemblies through the Left and Right Lighting Fault Sense circuits. When the Left or Right Turn Lamp is activated, the internal driver of the Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low when the Turn Lamps are illuminated. When the Turn Lamps are Off, the Lighting Fault Sense circuit voltage signal from the BCM is above 4 volts.

A failure in the Rear Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON and the voltage on the Lighting Fault Sense circuit is a constant voltage may indicate:
 - A poor connection in the harness connector.
 - The Lighting Fault Sense circuit is open.
 - The Tail Lamp Assembly ground circuit is open.
 - The Tail Lamp Assembly is inoperative.
- When the Tail Lamp Assembly harness connector is **connected** (back-probing), the Left or Right Turn Lamps are OFF and the voltage on the Lighting Fault Sense circuit is below 4 volts may indicate:
 - The Lighting Fault Sense circuit is shorted to ground.
 - The Tail Lamp Assembly is internally shorted.
 - Water or corrosion in the harness connector/terminal.
- When the Tail Lamp Assembly harness connector is **disconnected** and the voltage on Lighting Fault Sense circuit is below 4 volts (with none of the above faults are present) may indicate the BCM is not supplying the diagnostic voltage signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- **Bulb Equipped:** When the Right Turn Lamps are activated and the Body Control Module (BCM) detects greater than 7.86 amps on the Right Rear Turn Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the Right Turn Lamps are activated and the Body Control Module (BCM) detects greater than 3.0 amps on the Right Rear Turn Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Right Rear Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR TURN LAMP DRIVER CIRCUIT SHORTED TO GROUND RIGHT REAR TURN LAMP BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE RIGHT REAR TURN LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Rear Turn Lamp harness connector.

3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Rear Turn Lamp in accordance with the Service Information. Refer to **LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L62) RIGHT REAR TURN LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1646-15-REAR RIGHT TURN LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault

Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.

- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.
- The operating range is between 9.0 and 16.0 volts.

SET CONDITION

- **Incandescent Lamps:** When the Right Rear Turn Lamp is activated and the Body Control Module (BCM) detects less than 0.1 amperes on the Right Rear Turn Lamp Driver circuit for greater than five seconds.
- **LED Lamps:** When the Body Control Module (BCM) detects that either an internal fault or a circuit fault exists for the Right Tail Lamp Assembly.

DEFAULT ACTION

- The Right Rear Turn Lamp is always activated or inoperative.

POSSIBLE CAUSES

Possible Causes
GROUND CIRCUIT OPEN
RIGHT REAR TURN LAMP DRIVER CIRCUIT OPEN OR SHORTED TO VOLTAGE (IF EQUIPPED)
RIGHT STOP LAMP DRIVER CIRCUIT OPEN OR SHORTED TO VOLTAGE (IF EQUIPPED)
RIGHT STOP/TURN LAMP DRIVER CIRCUIT OPEN OR SHORTED TO VOLTAGE (IF EQUIPPED)
RIGHT REAR LIGHTING FAULT SENSE CIRCUIT OPEN (IF EQUIPPED)
RIGHT REAR TURN LAMP (BASE LAMP)
RIGHT TAIL LAMP ASSEMBLY (PREMIUM LAMP)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: **LED LAMPS ONLY:** After any Fault Sense circuit repair or replacement is completed, the Turn Lamps must be activated at least 20 cycles for the DTC status to change from Active to Stored. After the DTC status has been changed to Stored, the DTC can be erased from the internal memory of the Body Control Module (BCM).

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. With the scan tool, perform an ECU reset to the BCM, and then erase DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Record the Environmental Data.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE RIGHT TAIL LAMP GROUND CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the Right Tail Lamp Assembly harness connector.
3. Measure the resistance between ground and the Tail Lamp Ground circuit at the Right Tail Lamp Assembly harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the open in the Ground circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- **Incandescent Lamps:** Go To [3](#)
- **LED Lamps:** Go To Refer to [6](#).

3. CHECK FOR VOLTAGE ON THE (L62) RIGHT REAR TURN LAMP DRIVER CIRCUIT

NOTE: **Make sure the Turn Lamps are off when performing this step.**

1. Turn the ignition on.
2. Measure the voltage on the (L62) Right Rear Turn Lamp Driver circuit at the Right Tail Lamp Assembly harness connector.

Is there any voltage present?

Yes

- Repair the (L62) Right Rear Turn Lamp Driver circuit for an short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE BCM (L62) RIGHT REAR TURN LAMP OUTPUT FOR PROPER OPERATION

1. Turn the Right Turn Lamps on.
2. Connect a 12-volt test light between ground and the (L62) Right Rear Turn Lamp Driver circuit at the Right Tail Lamp Assembly harness connector.

Does the test light illuminate on and off in sequence?

Yes

- Replace the Right Rear Turn Lamp in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE (L62) RIGHT REAR TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C5/E harness connector.
3. Measure the resistance of the (L62) Right Rear Turn Lamp Driver circuit between the Right Tail Lamp Assembly harness connector and the BCM C5/E harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the (L62) Right Rear Turn Lamp Driver circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

6. CHECK FOR VOLTAGE ON THE RIGHT TURN LAMP DRIVER CIRCUIT

NOTE: Depending on the vehicle, and how it is equipped, the circuit being tested may be listed as the (L62) Right Rear Turn Lamp Driver circuit, the (L54) Right Stop Lamp Driver circuit, or the (L6) Right Stop/Turn Lamp Feed circuit.

NOTE: Make sure the Turn Lamps and Stop Lamps are off when performing this step.

1. Turn the ignition on.
2. Measure the voltage on the equipped Right Turn Lamp Driver circuit at the Right Tail Lamp Assembly harness connector.

Is there any voltage present?

Yes

- Repair the equipped Right Turn Lamp Driver circuit for an short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK FOR VOLTAGE ON THE (L562) RIGHT LIGHTING FAULT SENSE CIRCUIT

1. Measure the voltage on the (L562) Right Lighting Fault Sense circuit at the Right Tail Lamp Assembly harness connector.

Is the voltage below 4.0 volts?

Yes

- Go To [9](#)

No

- Go To [8](#)

8. CHECK THE EQUIPPED RIGHT TURN LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

NOTE: The circuit being tested may be listed as the (L62) Right Rear Turn Lamp Driver circuit, the (L54) Right Stop Lamp Driver circuit, or the (L6) Right Stop/Turn Feed Driver circuit.

1. Turn the ignition off.
2. Disconnect the BCM harness connector containing the circuit being tested.
3. Measure the resistance of the equipped Right Turn Lamp Driver circuit between the Right Tail Lamp Assembly harness connector and the BCM harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the Right Turn Lamp Driver circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [10](#)

9. CHECK THE (L562) RIGHT LIGHTING FAULT SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Measure the resistance of the (L562) Right Lighting Fault Sense circuit between the Right Tail Lamp Assembly harness connector and the BCM C6/F harness connector.

Is the resistance above 1 Ohm?

Yes

- Repair the (L562) Right Front Lighting Fault Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, perform an ECU reset to the BCM, and then erase DTCs.
9. Turn the ignition off for a minimum of 10.0 seconds.
10. Turn the ignition on.
11. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
12. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B165C-11-RIGHT SIGNATURE LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Left and Right Front Signature Lamps are integral to the Left and Right Front Lamp Assemblies and use Light Emitting Diodes (LEDs) for illumination. When the Body Control Module (BCM) receives a hardwired input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output, through the Left and Right Front Park Lamp Driver circuits, to integral controllers within the Left and Right Front Lamp Assemblies. The integral controllers then provide an internal Pulse Width Modulation (PWM) voltage to the Left and Right Front Signature Lamps. A ground path for the Left and Right Front Signature Lamps is present through the wiring harnesses of the Left and Right Front Lamp Assemblies, to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Park Lamps are activated and the Body Control Module (BCM) detects greater than 3.015 amps on the Right Front Park Lamp Driver circuit.

- Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- Right Front Signature Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT PARK LAMP DRIVER CIRCUIT SHORTED TO GROUND
RIGHT FRONT SIGNATURE LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE RIGHT FRONT SIGNATURE LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Front Signature Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Front Signature Lamp in accordance with the Service Information. Refer to **LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L118) RIGHT FRONT PARK LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B165D-11-LEFT SIGNATURE LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Left and Right Front Signature Lamps are integral to the Left and Right Front Lamp Assemblies and use Light Emitting Diodes (LEDs) for illumination. When the Body Control Module (BCM) receives a hardwired input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output, through the Left and Right Front Park Lamp Driver circuits, to integral controllers within the Left and Right Front Lamp Assemblies. The integral controllers then provide an internal Pulse Width Modulation (PWM) voltage to the Left and Right Front Signature Lamps. A ground path for the Left and Right Front Signature Lamps is present through the wiring harnesses of the Left and Right Front Lamp Assemblies, to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Park Lamps are activated and the Body Control Module (BCM) detects greater than 3.015 amps on the Left Front Park Lamp Driver circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- Left Front Signature Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT PARK LAMP DRIVER CIRCUIT SHORTED TO GROUND

Possible Causes
LEFT FRONT SIGNATURE LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LEFT FRONT SIGNATURE LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Front Signature Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Front Signature Lamp in accordance with the Service Information. Refer to **LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L117) LEFT FRONT PARK LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B168E-11-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND

For a complete FOG LAMPS SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects less than 50.0 Ohms on the Headlamp/Fog Lamp Switch Signal circuit for greater than 20.0 seconds.

DEFAULT ACTION

- The Front Fog Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE HEADLAMP SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L116) HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B168E-15-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 100k Ohms on the Headlamp/Fog Lamp Switch Signal circuit for greater than 20.0 seconds.

DEFAULT ACTION

- The Front Fog Lamps are always on or inoperative.

POSSIBLE CAUSES

Possible Causes
HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE
HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT OPEN
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE HEADLAMP SWITCH HARNESS CONNECTOR AND CHECK THE VOLTAGE ON THE (L116) HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L116) HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE (Z911) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

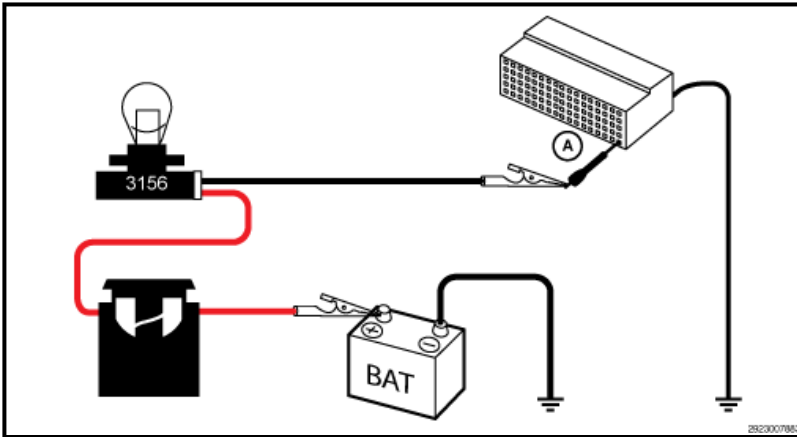
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load

testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L116) HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (L116) HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. With the scan tool, read the BCM DTCs.

Is DTC B168E-11-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B168E-2A-FRONT FOG LAMP SWITCH-STUCK

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects a continuous Fog Lamp Switch input for greater than 20 seconds.

DEFAULT ACTION

- The Front Fog Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
HEADLAMP SWITCH

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK IF AN ADDITIONAL DTC IS SET IN THE BCM

1. With the scan tool, read the Body Control Module (BCM) DTCs.

Does the scan tool display DTC B168E-11-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND as active?

Yes

- Perform the appropriate diagnostic test.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Inspect the Fog Lamp Switch for any debris or foreign material that could cause a sticking condition. If no problem is found, replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
-

2021 ACCESSORIES AND BODY, CAB

Body Control Module (BCM) - DTCS B16Af-11 To B1792-11 - Gladiator

DTC TROUBLESHOOTING

B16AF-11-LEFT STOP LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete STOP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Brake Pedal Travel Sensor is a hardwired input to the Anti-lock Brake System (ABS) Module. When the brake pedal is pressed, the Brake Pedal Travel Sensor sends an input signal to the ABS Module. The ABS Module sends an input signal through the Brake Signal 1 circuit, along with a redundant CAN C Bus message, to the Body Control Module (BCM), indicating the Brake Pedal is applied. The BCM provides a voltage output through the Left and Right Stop Lamp Driver circuit to the Left and Right Stop Lamps and through the Brake Lamp Switch Output circuit to the Center High Mounted Stop Lamp (CHMSL).

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Brake Pedal is applied and the Body Control Module (BCM) detects greater than 7.68 amperes on the Left Stop Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.
- **LED Equipped:** When the Brake Pedal is applied and the Body Control Module (BCM) detects greater than 3.0 amperes on the Left Stop Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Stop Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT STOP LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT STOP LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power

Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE LEFT TAIL LAMP ASSEMBLY FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Stop Lamp Bulb or Tail Lamp Assembly in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L9) LEFT STOP/TURN FEED CIRCUIT OR (L52) LEFT STOP LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

B16AF-15-LEFT STOP LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete STOP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Brake Pedal Travel Sensor is a hardwired input to the Anti-lock Brake System (ABS) Module. When the brake pedal is pressed, the Brake Pedal Travel Sensor sends an input signal to the ABS Module. The ABS Module sends an input signal through the Brake Signal 1 circuit, along with a redundant CAN C Bus message, to the Body Control Module (BCM), indicating the Brake Pedal is applied. The BCM provides a voltage output through the Left and Right Stop Lamp Driver circuit to the Left and Right Stop Lamps and through the Brake Lamp Switch Output circuit to the Center High Mounted Stop Lamp (CHMSL).

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Brake Pedal is applied and the Body Control Module (BCM) detects less than 0.35 amperes on the Left Stop Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Stop Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT STOP LAMP DRIVER CIRCUIT OPEN
LEFT STOP LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT STOP LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE LEFT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L9) LEFT STOP/TURN FEED CIRCUIT OR (L52) LEFT STOP LAMP DRIVER CIRCUIT

NOTE: **Make sure the Stop Lamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L9) LEFT STOP/TURN FEED CIRCUIT OR (L52) LEFT STOP LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE LEFT TAIL LAMP GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

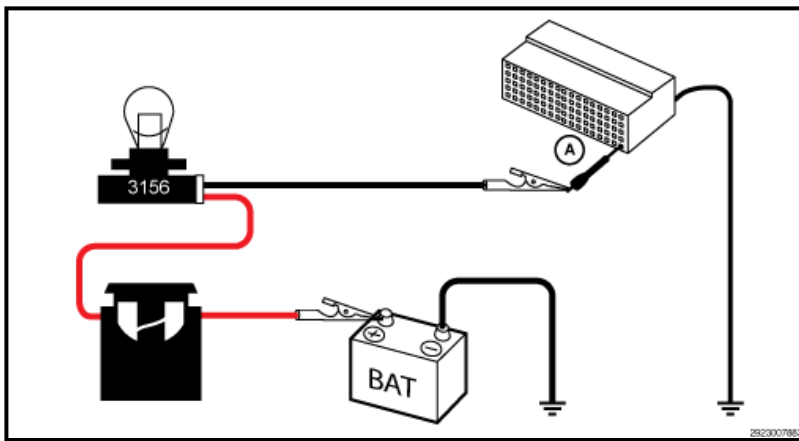
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L9) LEFT STOP/TURN FEED CIRCUIT OR (L52) LEFT STOP LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L9) LEFT STOP/TURN FEED CIRCUIT OR (L52) LEFT STOP LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Left Stop Lamp or Tail Lamp Assembly in accordance with the Service Information. Refer to **LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To **7**

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B16B3-11-RIGHT STOP LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete STOP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Brake Pedal Travel Sensor is a hardwired input to the Anti-lock Brake System (ABS) Module. When the brake pedal is pressed, the Brake Pedal Travel Sensor sends an input signal to the ABS Module. The ABS Module sends an input signal through the Brake Signal 1 circuit, along with a redundant CAN C Bus message, to the Body Control Module (BCM), indicating the Brake Pedal is applied. The BCM provides a voltage output through the Left and Right Stop Lamp Driver circuit to the Left and Right Stop Lamps and through the Brake Lamp Switch Output circuit to the Center High Mounted Stop Lamp (CHMSL).

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Brake Pedal is applied and the Body Control Module (BCM) detects greater than 7.68 amperes on the Right Stop Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.
- **LED Equipped:** When the Brake Pedal is applied and the Body Control Module (BCM) detects greater than 3.0 amperes on the Right Stop Lamp Driver circuit and for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Stop Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT STOP LAMP DRIVER CIRCUIT SHORTED TO GROUND
RIGHT STOP LAMP

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR** - Perform after wiring repair or module replacement:

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE RIGHT TAIL LAMP ASSEMBLY FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Right Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Stop Lamp Bulb or Tail Lamp Assembly in accordance with the Service Information. Refer to **LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION**.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. **DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L6) RIGHT STOP/TURN FEED CIRCUIT OR (L54) RIGHT STOP LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND**

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. **DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS**

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16B3-15-RIGHT STOP LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete STOP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Brake Pedal Travel Sensor is a hardwired input to the Anti-lock Brake System (ABS) Module. When the brake pedal is pressed, the Brake Pedal Travel Sensor sends an input signal to the ABS Module. The ABS Module sends an input signal through the Brake Signal 1 circuit, along with a redundant CAN C Bus message, to the Body Control Module (BCM), indicating the Brake Pedal is applied. The BCM provides a voltage output through the Left and Right Stop Lamp Driver circuit to the Left and Right Stop Lamps and through the Brake Lamp Switch Output circuit to the Center High Mounted Stop Lamp (CHMSL).

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Brake Pedal is applied and the Body Control Module (BCM) detects less than 0.35 amperes on the Right Stop Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Stop Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT STOP LAMP DRIVER CIRCUIT OPEN
RIGHT STOP LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
RIGHT STOP LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE RIGHT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L6) RIGHT STOP/TURN FEED CIRCUIT OR (L54) RIGHT STOP LAMP DRIVER CIRCUIT

NOTE: Make sure the Stop Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L6) RIGHT STOP/TURN FEED CIRCUIT OR (L54) RIGHT STOP LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

4. CHECK THE RIGHT TAIL LAMP GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

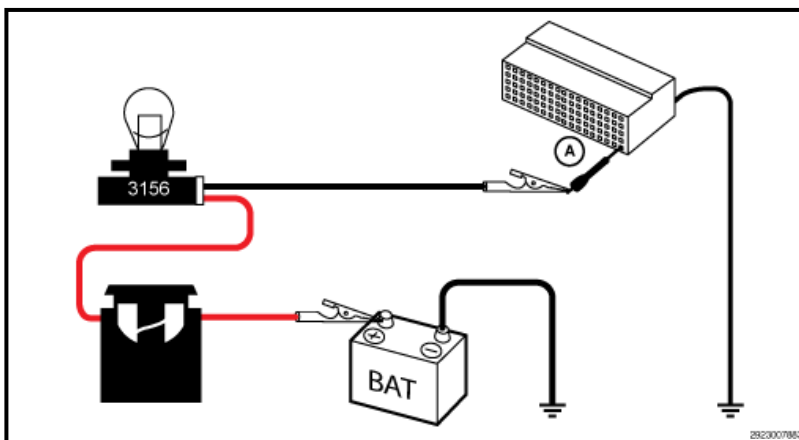
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L6) RIGHT STOP/TURN FEED CIRCUIT OR (L54) RIGHT STOP LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L6) RIGHT STOP/TURN FEED CIRCUIT OR (L54) RIGHT STOP LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Right Stop Lamp or Tail Lamp Assembly in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B16B7-11-CENTER STOP LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete STOP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Brake Pedal Travel Sensor is a hardwired input to the Anti-lock Brake System (ABS) Module. When the brake pedal is pressed, the Brake Pedal Travel Sensor sends an input signal to the ABS Module. The ABS Module sends an input signal through the Brake Signal 1 circuit, along with a redundant CAN C Bus message, to the Body Control Module (BCM), indicating the Brake Pedal is applied. The BCM provides a voltage output through the Left and Right Stop Lamp Driver circuit to the Left and Right Stop Lamps and through the Brake Lamp Switch Output circuit to the Center High Mounted Stop Lamp (CHMSL).

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Brake Pedal is applied and the Body Control Module (BCM) detects greater than 2.5 amperes on the Brake Lamp Switch Output circuit for greater than four seconds.

- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Center High Mounted Stop Lamp (CHMSL) is inoperative.

POSSIBLE CAUSES

Possible Causes
BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND CENTER HIGH MOUNTED STOP LAMP (CHMSL) BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE CENTER HIGH MOUNTED STOP LAMP (CHMSL) FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Center High Mounted Stop Lamp (CHMSL) harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Center High Mounted Stop Lamp Bulb or Assembly in accordance with the Service Information. Refer to [LAMP, CENTER HIGH MOUNTED STOP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L51) BRAKE LAMP SWITCH OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16B7-15-CENTER STOP LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete STOP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Brake Pedal Travel Sensor is a hardwired input to the Anti-lock Brake System (ABS) Module. When the brake pedal is pressed, the Brake Pedal Travel Sensor sends an input signal to the ABS Module. The ABS Module sends an input signal through the Brake Signal 1 circuit, along with a redundant CAN C Bus message, to the Body Control Module (BCM), indicating the Brake Pedal is applied. The BCM provides a voltage output through the Left and Right Stop Lamp Driver circuit to the Left and Right Stop Lamps and through the Brake Lamp Switch Output circuit to the Center High Mounted Stop Lamp (CHMSL).

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Brake Pedal is applied and the Body Control Module (BCM) detects less than 5 milliamperes on the Brake Lamp Switch Output circuit for greater than five seconds.

DEFAULT ACTION

- The Center High Mounted Stop Lamp (CHMSL) is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN
BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
CENTER HIGH MOUNTED STOP LAMP (CHMSL)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE CENTER HIGH MOUNTED STOP LAMP (CHMSL) HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L51) BRAKE LAMP SWITCH OUTPUT CIRCUIT

NOTE: **Make sure the Stop Lamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L51) BRAKE LAMP SWITCH OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE

NOTE: Make sure the brake pedal is not applied while performing this step.

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE CHMSL GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load

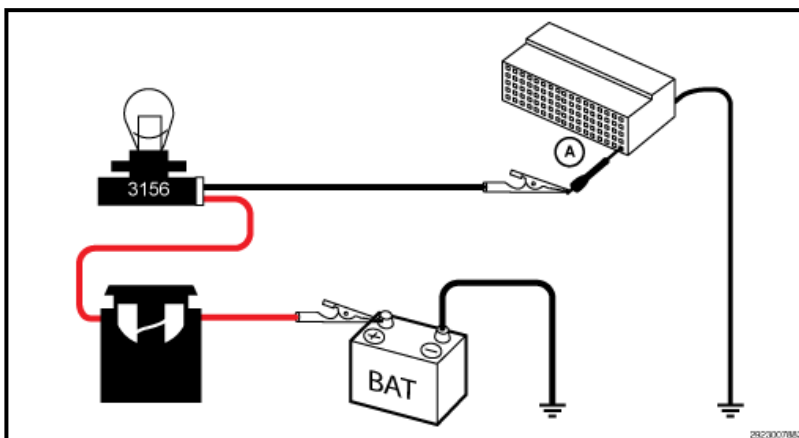
test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE:

When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L51) BRAKE LAMP SWITCH OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L51) BRAKE LAMP SWITCH OUTPUT CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Center High Mounted Stop Lamp (CHMSL) or Tail Lamp Assembly in accordance with the Service Information. Refer to [**LAMP, CENTER HIGH MOUNTED STOP, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16CF-11-LEFT DRL LAMP CONTROL - CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Daytime Running Lamps (DRLs) illuminate when the Engine is running, the Park Brake is released and the Headlamp Switch is in the OFF or AUTO position. When the Body Control Module (BCM) receives a CAN message from the PCM, indicating the engine is running, a hard-wired input from the Headlamp Switch,

indicating the Headlamp Switch is Off or in the AUTO position, and a hard-wired input from the Park Brake Switch, indicating that the Park Brake is released, the BCM provides a voltage output to the DRLs through the Right and Left DRL Lamp Driver circuits.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Daytime Running Lamps (DRL) are active and the Body Control Module (BCM) detects greater than 3.015 amps on the Left DRL Lamp Driver circuit for greater than 1.28 seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Daytime Running Lamps (DRL) is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT DRL LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT DAYTIME RUNNING LAMP (DRL)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LEFT DAYTIME RUNNING LAMP (DRL) FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Daytime Running Lamp (DRL) harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Daytime Running Lamp (DRL) in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L58) LEFT DRL LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B16CF-15-LEFT DRL LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Daytime Running Lamps (DRLs) illuminate when the Engine is running, the Park Brake is released and the Headlamp Switch is in the OFF or AUTO position. When the Body Control Module (BCM) receives a CAN message from the PCM, indicating the engine is running, a hard-wired input from the Headlamp Switch, indicating the Headlamp Switch is Off or in the AUTO position, and a hard-wired input from the Park Brake Switch, indicating that the Park Brake is released, the BCM provides a voltage output to the DRLs through the Right and Left DRL Lamp Driver circuits.

WHEN MONITORED

- This diagnostic runs continuously when continuously when the ignition is on.

SET CONDITION

- When the Daytime Running Lamps (DRLs) transition from Off to On and the Body Control Module (BCM) detects an open or short to voltage on the Left DRL Lamp Control circuit for greater than 1.28 seconds.

POSSIBLE CAUSES

Possible Causes
LEFT DRL LAMP CONTROL CIRCUIT OPEN
LEFT DRL LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT DAYTIME RUNNING LAMP (DRL)
BODY CONTROL MODULE (BCM)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE LEFT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK THE VOLTAGE ON THE (L58) LEFT DRL LAMP DRIVER CIRCUIT

NOTE: Make sure the Daytime Running Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L58) LEFT DRL LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE LEFT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

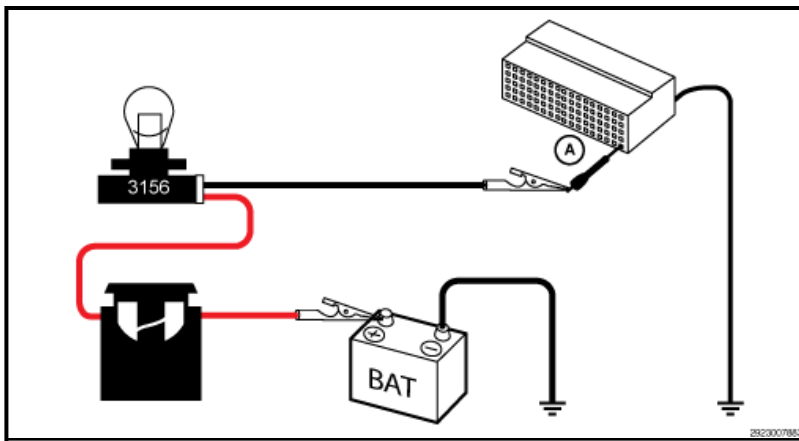
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage

drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L58) LEFT DRL LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L58) LEFT DRL LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the test light to that of a direct connection to Battery.

Is the test light illuminated and bright with the system or ECU output activated?

Yes

- Replace the Left Daytime Running Lamp (DRL) in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16D3-11-RIGHT DRL LAMP CONTROL - CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Daytime Running Lamps (DRLs) illuminate when the Engine is running, the Park Brake is released and the Headlamp Switch is in the OFF or AUTO position. When the Body Control Module (BCM) receives a CAN message from the PCM, indicating the engine is running, a hard-wired input from the Headlamp Switch, indicating the Headlamp Switch is Off or in the AUTO position, and a hard-wired input from the Park Brake Switch, indicating that the Park Brake is released, the BCM provides a voltage output to the DRLs through the Right and Left DRL Lamp Driver circuits.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Daytime Running Lamps (DRL) are active and the Body Control Module (BCM) detects greater than 3.015 amps on the Right DRL Lamp Driver circuit for greater than 1.28 seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Daytime Running Lamps (DRL) is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT DRL LAMP DRIVER CIRCUIT SHORTED TO GROUND
RIGHT DAYTIME RUNNING LAMP (DRL)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE RIGHT DAYTIME RUNNING LAMP (DRL) FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Daytime Running Lamp (DRL) harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Daytime Running Lamp (DRL) in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L59) RIGHT DRL LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16D3-15-RIGHT DRL LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Daytime Running Lamps (DRLs) illuminate when the Engine is running, the Park Brake is released and the Headlamp Switch is in the OFF or AUTO position. When the Body Control Module (BCM) receives a CAN message from the PCM, indicating the engine is running, a hard-wired input from the Headlamp Switch, indicating the Headlamp Switch is Off or in the AUTO position, and a hard-wired input from the Park Brake Switch, indicating that the Park Brake is released, the BCM provides a voltage output to the DRLs through the Right and Left DRL Lamp Driver circuits.

WHEN MONITORED

- This diagnostic runs continuously when continuously when the ignition is on.

SET CONDITION

- When the Daytime Running Lamps (DRLs) transition from Off to On and the Body Control Module (BCM) detects an open or short to voltage on the Right DRL Lamp Control circuit for greater than 1.28 seconds.

POSSIBLE CAUSES

Possible Causes
RIGHT DRL LAMP CONTROL CIRCUIT OPEN
RIGHT DRL LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
RIGHT DAYTIME RUNNING LAMP (DRL)

DIAGNOSTIC TEST**1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE RIGHT FRONT LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK THE VOLTAGE ON THE (L59) RIGHT DRL LAMP DRIVER CIRCUIT

NOTE: Make sure the Daytime Running Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L59) RIGHT DRL LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. CHECK THE RIGHT FRONT LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

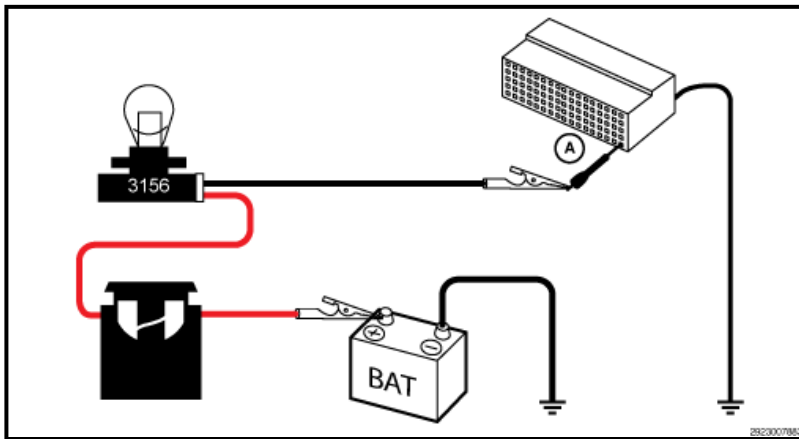
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L59) RIGHT DRL LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L59) RIGHT DRL LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the test light to that of a direct connection to Battery.

Is the test light illuminated and bright with the system or ECU output activated?

Yes

- Replace the Right Daytime Running Lamp (DRL) in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16D7-11-LEFT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects greater than 4.6 amperes on the Left Park Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Left Rear Park Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT REAR PARK LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT REAR PARK LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE LEFT TAIL LAMP ASSEMBLY FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Left Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Park Lamp Bulb or Tail Lamp Assembly in accordance with the Service Information. Refer to [**LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L71) LEFT REAR PARK LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16D7-15-LEFT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects less than 0.16 amperes on the Left Rear Park Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Left Rear Park is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT REAR PARK LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
LEFT REAR PARK LAMP DRIVER CIRCUIT OPEN
GROUND CIRCUIT OPEN
LEFT REAR PARK LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE LEFT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L71) LEFT REAR PARK LAMP DRIVER CIRCUIT

NOTE: Make sure the Park Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L71) LEFT REAR PARK LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. CHECK THE LEFT TAIL LAMP ASSEMBLY GROUND CIRCUITS FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuits at the component harness connectors (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

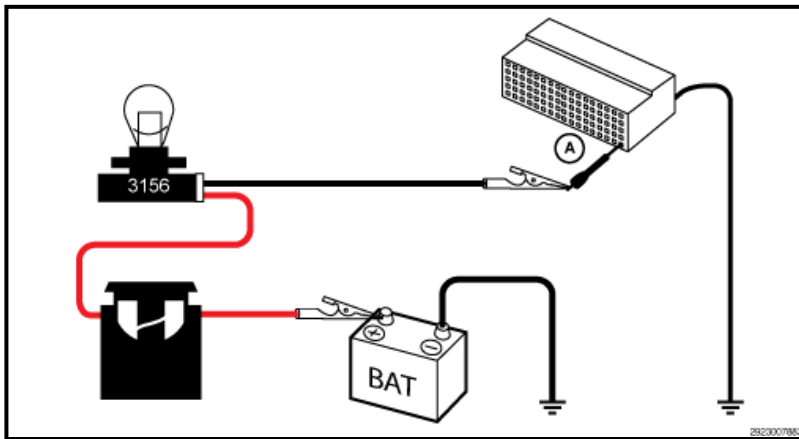
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright for both connections?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L71) LEFT REAR PARK LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L71) LEFT REAR PARK LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly for both connections?

Yes

- Replace the appropriate Left Rear Park Lamp Bulb or Tail Lamp Assembly in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [**MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B16DF-11-RIGHT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects greater than 4.6 amperes on the Right Rear Park Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Right Rear Park Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR PARK LAMP DRIVER CIRCUIT SHORTED TO GROUND
RIGHT REAR PARK LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE RIGHT TAIL LAMP ASSEMBLY FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Right Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Park Lamp Bulb or Tail Lamp Assembly in accordance with the Service Information. Refer to [**LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L72) RIGHT REAR PARK LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16DF-15-RIGHT TAILLAMP 1 CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects less than 0.16 amperes on the Right Rear Park Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Right Rear Park Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR PARK LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
RIGHT REAR PARK LAMP DRIVER CIRCUIT OPEN
GROUND CIRCUIT OPEN
RIGHT REAR PARK LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE LEFT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L72) RIGHT REAR PARK LAMP DRIVER CIRCUIT

NOTE: Make sure the Park Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L72) RIGHT REAR PARK LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Go To [7](#)

4. CHECK THE RIGHT TAIL LAMP ASSEMBLY GROUND CIRCUITS FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuits at the component harness connectors (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#).**

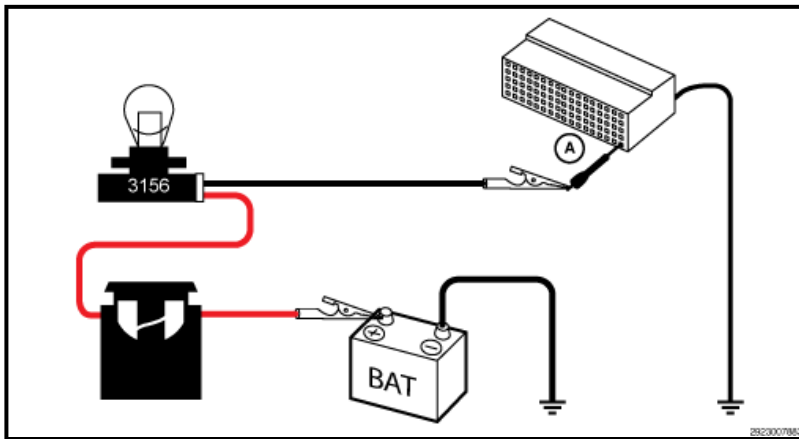
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright for both connections?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L72) RIGHT REAR PARK LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L72) RIGHT REAR PARK LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly for both connections?

Yes

- Replace the appropriate Right Rear Park Lamp Bulb or Tail Lamp Assembly in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16E7-11-LICENSE PLATE LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects greater than 1.3 amperes on the License Plate Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The License Plate Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LICENSE PLATE LAMP DRIVER CIRCUIT SHORTED TO GROUND
LICENSE PLATE LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LICENSE PLATE LAMP FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the License Plate Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the License Plate Lamp Bulb in accordance with the Service Information. Refer to [LAMP, LICENSE PLATE, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L3) LICENSE PLATE LAMP CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16E7-15-LICENSE PLATE LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Park Lamps are active and the Body Control Module (BCM) detects less than 1.6 amps on the License Plate Lamp Driver circuit for greater than five seconds.
- **LED Equipped:** When the Park Lamps are active and the Body Control Module (BCM) detects less than 5.0 milliamps on the License Plate Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The License Plate Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LICENSE PLATE LAMP DRIVER CIRCUIT OPEN
LICENSE PLATE LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE

Possible Causes
GROUND CIRCUIT OPEN
LICENSE PLATE LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE LEFT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L3) LICENSE PLATE LAMP CONTROL CIRCUIT

NOTE: Make sure the Park Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L3) LICENSE PLATE LAMP CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE LICENSE PLATE LAMP GROUND CIRCUITS FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

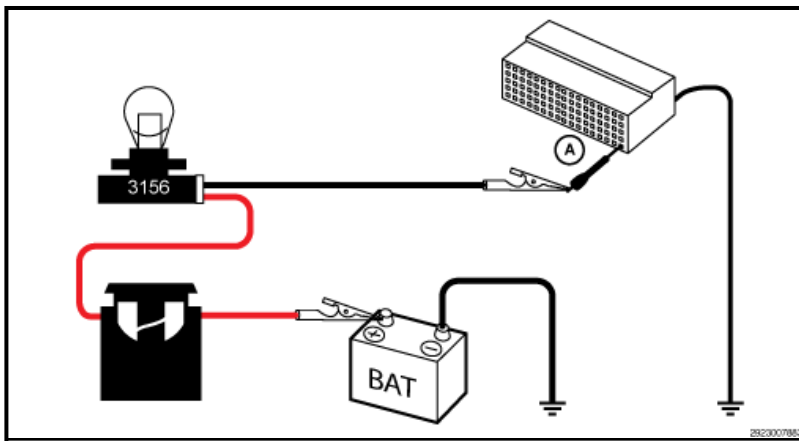
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage

drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L3) LICENSE PLATE LAMP CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L3) LICENSE PLATE LAMP CONTROL CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the License Plate Lamp Bulb in accordance with the Service Information. Refer to [LAMP, LICENSE PLATE, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16EF-11-LEFT PARK LAMP 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects greater than 2.9 amps on the Left Front Park Lamp Driver circuit for greater than four seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Left Front Park Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT PARK LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT FRONT PARK LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE LEFT FRONT PARK LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Front Park Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Front Park Lamp in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L77) LEFT FRONT PARK LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16F3-11-RIGHT PARK LAMP 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects greater than 2.9 amps on the Right Front Park Lamp Driver circuit for greater than four seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Right Front Park Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT PARK LAMP DRIVER CIRCUIT SHORTED TO GROUND

Possible Causes
RIGHT FRONT PARK LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RIGHT FRONT PARK LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Front Park Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Front Park Lamp in accordance with the Service Information. Refer to **UNIT, HEADLAMP, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L78) RIGHT FRONT PARK LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16F7-11-FRONT LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects greater than 7.86 amps on the Left Front Fog Lamp Control circuit for greater than four seconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects greater than 3.0 amps on the Left Front Fog Lamp Control circuit for greater than four seconds and four retry attempts have failed.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Fog Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT FOG LAMP CONTROL CIRCUIT SHORTED TO GROUND
LEFT FRONT FOG LAMP

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE LEFT FRONT FOG LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Front Fog Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Front Fog Lamp in accordance with the Service Information. Refer to **LAMP, FOG, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L89) LEFT FRONT FOG LAMP CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.

2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B16F7-15-FRONT LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FOG LAMPS SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects less than 0.35 amps on the Left Front Fog Lamp Control circuit for greater than five seconds.
- **LED Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects less than 0.5 milliamps on the Left Front Fog Lamp Control circuit for greater than five seconds.

DEFAULT ACTION

- The Fog Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT FOG LAMP CONTROL CIRCUIT OPEN
LEFT FRONT FOG LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT FRONT FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE LEFT FRONT FOG LAMP HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L89) LEFT FRONT FOG LAMP CONTROL CIRCUIT

NOTE: Make sure the Fog Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L89) LEFT FRONT FOG LAMP CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. CHECK THE LEFT FRONT FOG LAMP GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

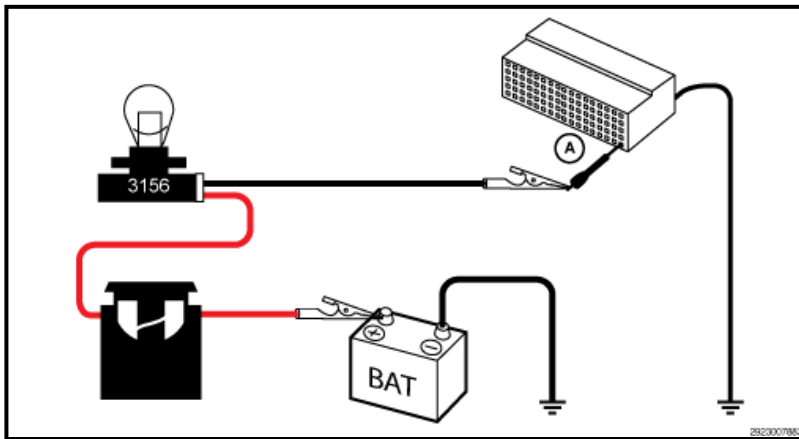
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L89) LEFT FRONT FOG LAMP CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L89) LEFT FRONT FOG LAMP CONTROL CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Left Front Fog Lamp in accordance with the Service Information. Refer to [LAMP, FOG, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B16FB-11-FRONT RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects greater than 7.86 amps on the Right Front Fog Lamp Control circuit for greater than four seconds.

- Four consecutive BCM output retry attempts have failed within the same ignition cycle.
- **LED Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects greater than 3.0 amps on the Right Front Fog Lamp Control circuit for greater than four seconds.
- Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Fog Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT FOG LAMP CONTROL CIRCUIT SHORTED TO GROUND
RIGHT FRONT FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE RIGHT FRONT FOG LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Front Fog Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Front Fog Lamp in accordance with the Service Information. Refer to **LAMP, FOG, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L90) RIGHT FRONT FOG LAMP CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16FB-15-FRONT RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Front Fog Lamps: The Front Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Front Fog Lamp Control Circuits, to the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

LED Front Fog Lamps: The Fog Lamp Switch is integral to the Headlamp Switch. When the Body Control Module (BCM) receives an input signal from the Headlamp Switch, requesting Front Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Front Fog Lamp Control Circuits, to activate the Left and Right Front Fog Lamps. A separate ground circuit is provided to the Left and Right Front Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Bulb Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects less than 0.35 amps on the Right Front Fog Lamp Control circuit for greater than five seconds.
- **LED Equipped:** When the Front Fog Lamps are active and the Body Control Module (BCM) detects less than 0.5 milliamps on the Right Front Fog Lamp Control circuit for greater than five seconds.

DEFAULT ACTION

- The Fog Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT FOG LAMP CONTROL CIRCUIT OPEN
RIGHT FRONT FOG LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
RIGHT FRONT FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE RIGHT FRONT FOG LAMP HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L90) RIGHT FRONT FOG LAMP CONTROL CIRCUIT

NOTE: **Make sure the Fog Lamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L90) RIGHT FRONT FOG LAMP CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE RIGHT FRONT FOG LAMP GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1

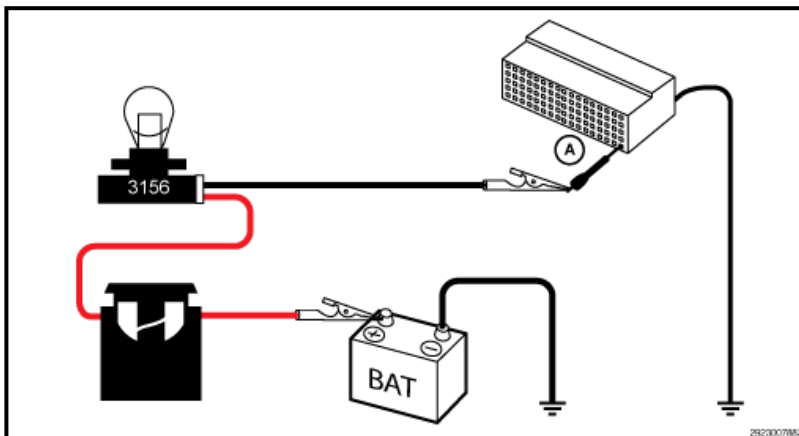
amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE:

When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L90) RIGHT FRONT FOG LAMP CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L90) RIGHT FRONT FOG LAMP CONTROL CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Right Front Fog Lamp in accordance with the Service Information. Refer to [LAMP, FOG, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16FF-11-REAR LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Rear Fog Lamp Feed Circuits, to the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

LED Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Rear Fog Lamp Feed Circuits, to activate the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Rear Fog Lamps are active and the Body Control Module (BCM) detects greater than 3.015 amperes on the Left Rear Fog Lamp Feed circuit for greater than 1.28 seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Rear Fog Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT REAR FOG LAMP FEED CIRCUIT SHORTED TO GROUND
LEFT REAR FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LEFT REAR FOG LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Rear Fog Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Rear Fog Lamp in accordance with the Service Information. Refer to **LAMP, FOG, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L899) LEFT REAR FOG LAMP FEED CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B16FF-15-REAR LEFT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Rear Fog Lamp Feed Circuits, to the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

LED Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Rear Fog Lamp Feed Circuits, to activate the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Rear Fog Lamps are active and the Body Control Module (BCM) detects less than 0.333 volts on the Left Rear Fog Lamp Feed circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Rear Fog Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT REAR FOG LAMP FEED CIRCUIT OPEN
LEFT REAR FOG LAMP FEED CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT REAR FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE LEFT REAR FOG LAMP HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L899) LEFT REAR FOG LAMP FEED CIRCUIT

NOTE: **Make sure the Fog Lamps are off when performing this step.**

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L899) LEFT REAR FOG LAMP FEED CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

4. CHECK THE LEFT REAR FOG LAMP GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.

2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

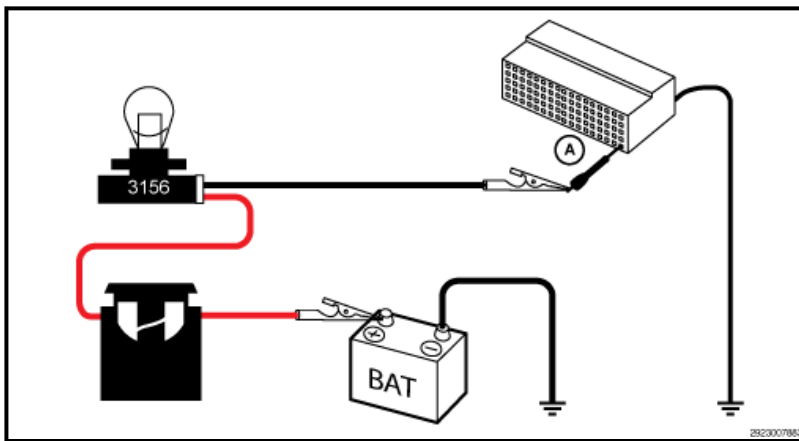
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L899) LEFT REAR FOG LAMP FEED CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L899) LEFT REAR FOG LAMP FEED CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Left Rear Fog Lamp in accordance with the Service Information. Refer to [LAMP, FOG, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1703-11-REAR RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Rear Fog Lamp Feed Circuits, to the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

LED Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Rear Fog Lamp Feed Circuits, to activate the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Rear Fog Lamps are active and the Body Control Module (BCM) detects greater than 3.015 amperes on the Right Rear Fog Lamp Feed circuit for greater than 1.28 seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Rear Fog Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR FOG LAMP FEED CIRCUIT SHORTED TO GROUND
RIGHT REAR FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RIGHT REAR FOG LAMP FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Right Rear Fog Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Rear Fog Lamp in accordance with the Service Information. Refer to **LAMP, FOG, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L898) RIGHT REAR FOG LAMP FEED CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1703-15-REAR RIGHT FOG LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FOG LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Incandescent Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Rear Fog Lamp Feed Circuits, to the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

LED Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Rear Fog Lamp Feed Circuits, to activate the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Fog Lamps are active and the Body Control Module (BCM) detects less than 0.333 volts on the Right Rear Fog Lamp Feed circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Rear Fog Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR FOG LAMP FEED CIRCUIT OPEN
RIGHT REAR FOG LAMP FEED CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
RIGHT REAR FOG LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE RIGHT REAR FOG LAMP HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L898) RIGHT REAR FOG LAMP CIRCUIT

NOTE: Make sure the Fog Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L898) RIGHT REAR FOG LAMP CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. CHECK THE RIGHT REAR FOG LAMP GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

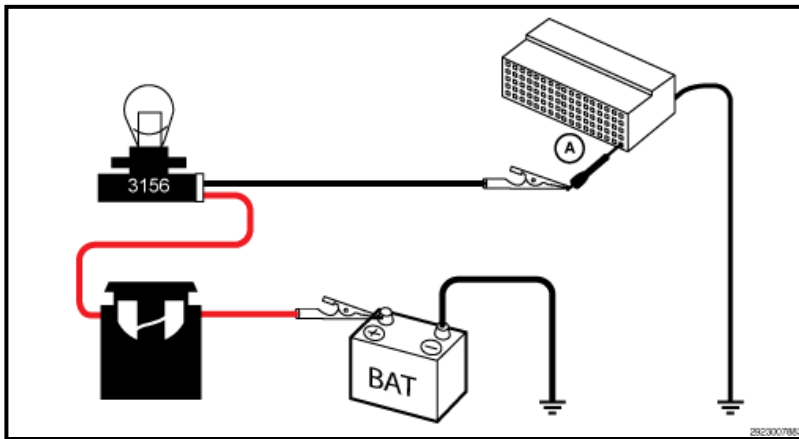
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L898) RIGHT REAR FOG LAMP CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L898) RIGHT REAR FOG LAMP CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Right Rear Fog Lamp in accordance with the Service Information. Refer to [LAMP, FOG, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1707-11-LEFT REVERSE LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete BACK UP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

When the Body Control Module (BCM) receives a CAN Bus message from the Transmission Control Module (TCM), indicating the transmission is in the REVERSE position, the BCM provides a voltage output through the Left and Right Backup Lamp Driver circuit to the Left and Right Backup Lamps. A ground path for the Left and Right Backup Lamps is present through the harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Backup Lamps are active and the Body Control Module (BCM) detects greater than 5.7 amperes on the Left Backup Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Backup Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT BACKUP LAMP DRIVER CIRCUIT SHORTED TO GROUND
LEFT BACKUP LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE LEFT BACKUP LAMP FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Left Backup Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Backup Lamp in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L15) LEFT BACKUP LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1707-15-LEFT REVERSE LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete BACK UP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives a CAN Bus message from the Transmission Control Module (TCM), indicating the transmission is in the REVERSE position, the BCM provides a voltage output through the Left and Right Backup Lamp Driver circuit to the Left and Right Backup Lamps. A ground path for the Left and Right Backup Lamps is present through the harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- **Bulb Equipped:** When the Backup Lamps are active and the Body Control Module (BCM) detects less than 0.35 amperes on the Left Backup Lamp Driver circuit for greater than five seconds.
- **LED Equipped:** When the Backup Lamps are active and the Body Control Module (BCM) detects less than 5.0 milliamperes on the Left Backup Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Backup Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT BACKUP LAMP DRIVER CIRCUIT OPEN
LEFT BACKUP LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
LEFT BACKUP LAMP BULB

Possible Causes

BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE LEFT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L15) LEFT BACKUP LAMP DRIVER CIRCUIT

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L15) LEFT BACKUP LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Go To [7](#)

4. CHECK THE LEFT TAIL LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Make sure the Backup Lamps are off when performing this step.

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

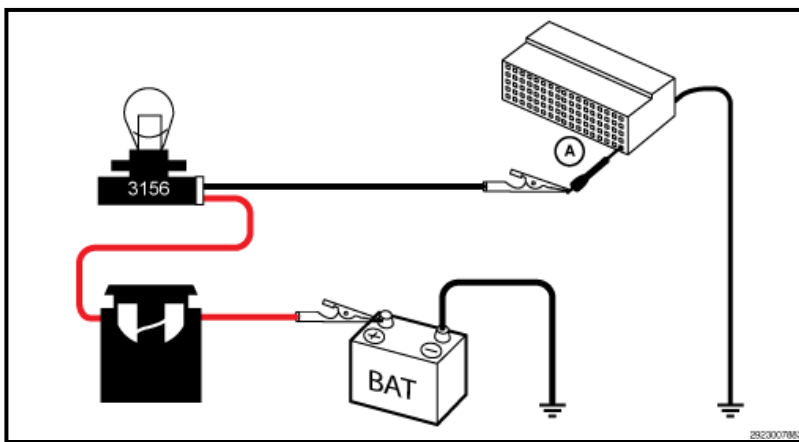
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#).

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L15) LEFT BACKUP LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L15) LEFT BACKUP LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Left Backup Lamp in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B170B-11-RIGHT REVERSE LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete BACK UP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

When the Body Control Module (BCM) receives a CAN Bus message from the Transmission Control Module (TCM), indicating the transmission is in the REVERSE position, the BCM provides a voltage output through the Left and Right Backup Lamp Driver circuit to the Left and Right Backup Lamps. A ground path for the Left and Right Backup Lamps is present through the harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Backup Lamps are active and the Body Control Module (BCM) detects greater than 5.7 amperes on the Right Backup Lamp Driver circuit for greater than four seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Backup Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT BACKUP LAMP DRIVER CIRCUIT SHORTED TO GROUND
RIGHT BACKUP LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RIGHT BACKUP LAMP FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Right Backup Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Backup Lamp in accordance with the Service Information. Refer to **LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L16) RIGHT BACKUP LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B170B-15-RIGHT REVERSE LAMP CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete BACK UP LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives a CAN Bus message from the Transmission Control Module (TCM), indicating the transmission is in the REVERSE position, the BCM provides a voltage output through the Left and Right Backup Lamp Driver circuit to the Left and Right Backup Lamps. A ground path for the Left and Right Backup Lamps is present through the harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- **Bulb Equipped:** When the Backup Lamps are active and the Body Control Module (BCM) detects less than 0.35 amperes on the Right Backup Lamp Driver circuit for greater than five seconds.
- **LED Equipped:** When the Backup Lamps are active and the Body Control Module (BCM) detects less than 5.0 milliamperes on the Right Backup Lamp Driver circuit for greater than five seconds.

DEFAULT ACTION

- The Backup Lamp is always on or inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT BACKUP LAMP DRIVER CIRCUIT OPEN
RIGHT BACKUP LAMP DRIVER CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN

Possible Causes
RIGHT BACKUP LAMP BULB
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE LEFT TAIL LAMP ASSEMBLY HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (L16) RIGHT BACKUP LAMP DRIVER CIRCUIT

NOTE: Make sure the Backup Lamps are off when performing this step.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L16) RIGHT BACKUP LAMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

4. CHECK THE RIGHT TAIL LAMP ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

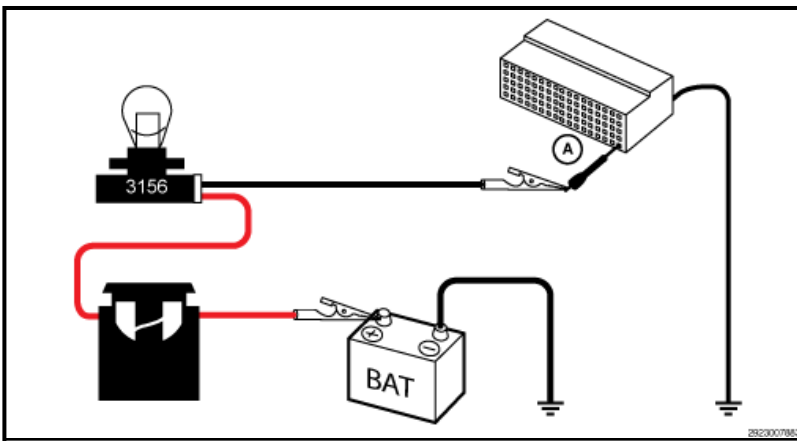
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage

drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L16) RIGHT BACKUP LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A 12-VOLT TEST LIGHT BETWEEN GROUND AND THE (L16) RIGHT BACKUP LAMP DRIVER CIRCUIT - CHECK THE BCM OUTPUT

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Using a 12-volt test light, connect the test light lead to a known good ground.
3. With the 12-volt test light, probe the circuit being tested at the component harness connector.
4. Turn the ignition on.
5. Activate the system or ECU output for the circuit being tested.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Right Backup Lamp in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1751-11-COURTESY LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete INTERIOR LIGHTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a battery voltage output to the Dome, Cargo and Footwell Lamps through the Courtesy Lamps Driver circuits. A dedicated path to ground is provided through the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Courtesy Lamps are active and the Body Control Module (BCM) detects greater than 12.3 amps on the Courtesy Lamps Driver circuit for greater than 1.28 seconds.

- Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Courtesy Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
COURTESY LAMPS DRIVER CIRCUIT SHORTED TO GROUND
COURTESY LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK EACH LAMP ON THE (M11) COURTESY LAMPS DRIVER CIRCUIT (ONE AT A TIME) FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect a Courtesy Lamp harness connector on the (M11) Courtesy Lamps Driver circuit.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Repeat this step for all the Courtesy Lamps on the circuit. If the DTC is still active once all the lamps are disconnected, Go To [3](#)

No

- Replace the Courtesy Lamp causing the short to ground condition in accordance with the Service Information. Refer to [LAMP, COURTESY, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (M11) COURTESY LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B177A-11-LEFT FRONT LAMP DIAGNOSTIC LINE-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) receives a signal from the Lamp Assembly, through the Fault Sense circuit, indicating a fault is present for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
FAULT SENSE CIRCUIT SHORTED TO GROUND
LAMP ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: To change the status of this DTC from Active to Stored, or to erase the DTC from the module's internal memory, the Turn Lamps must be activated for at least 20 cycles. Failure to perform this after a Fault Sense circuit repair is completed, or the Lamp Assembly is replaced, may lead to an incorrect repair.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LEFT FRONT LAMP ASSEMBLY FOR AN INTERNAL SHORT

1. Turn the ignition off.
2. Disconnect the Left Front Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Left Front Lamp Assembly in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE (L551) LEFT FRONT LIGHTING FAULT SENSE CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Check for continuity between ground and the (L551) Left Front Lighting Fault Sense circuit at the Left Front Lamp Assembly harness connector.

Is there continuity between ground and the (L551) Left Front Lighting Fault Sense circuit?

Yes

- Repair the (L551) Left Front Lighting Fault Sense circuit for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B177B-11-RIGHT FRONT LAMP DIAGNOSTIC LINE-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) receives a signal from the Lamp Assembly, through the Fault Sense circuit, indicating a fault is present for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
FAULT SENSE CIRCUIT SHORTED TO GROUND
LAMP ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: To change the status of this DTC from Active to Stored, or to erase the DTC from the module's internal memory, the Turn Lamps must be activated for at least 20 cycles. Failure to perform this after a Fault Sense circuit repair is completed, or the Lamp Assembly is replaced, may lead to an incorrect repair.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE RIGHT FRONT LAMP ASSEMBLY FOR AN INTERNAL SHORT

1. Turn the ignition off.
2. Disconnect the Right Front Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Right Front Lamp Assembly in accordance with the Service Information. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE (L552) RIGHT FRONT LIGHTING FAULT SENSE CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Check for continuity between ground and the (L552) Right Front Lighting Fault Sense circuit at the Right Front Lamp Assembly harness connector.

Is there continuity between ground and the (L552) Right Front Lighting Fault Sense circuit?

Yes

- Repair the (L552) Right Front Lighting Fault Sense circuit for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B178E-11-HEADLAMP SWITCH INPUT-CIRCUIT SHORT TO GROUND

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a 5 volt reference voltage to the Headlamp Switch, through the Headlamp Switch MUX circuit and provides a ground through the Headlamp Switch MUX Return circuit. When the BCM detects the activation of the Headlamp Switch, the BCM provides the appropriate output for the requested exterior lamp(s).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Headlamps are active and the Body Control Module (BCM) detects less than 0.569 volts on the Headlamp Switch MUX circuit for greater than 10 seconds.

DEFAULT ACTION

- The Headlamps and Park Lamps are always on.

POSSIBLE CAUSES

Possible Causes
HEADLAMP SWITCH MUX CIRCUIT SHORTED TO GROUND
HEADLAMP SWITCH MUX CIRCUIT SHORTED TO THE HEADLAMP SWITCH MUX RETURN CIRCUIT
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE HEADLAMP SWITCH FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Headlamp Switch harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L307) HEADLAMP SWITCH MUX CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE (L307) HEADLAMP SWITCH MUX CIRCUIT FOR A SHORT TO THE (L900) HEADLAMP SWITCH MUX RETURN CIRCUIT

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
3. With the other lead of the DVOM probe the other circuit at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and the other circuit?

Yes

- Repair the short between the circuits. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B178E-15-HEADLAMP SWITCH INPUT-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HEADLAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a 5 volt reference voltage to the Headlamp Switch, through the Headlamp Switch MUX circuit and provides a ground through the Headlamp Switch MUX Return circuit. When the BCM detects the activation of the Headlamp Switch, the BCM provides the appropriate output for the requested exterior lamp(s).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Headlamps are active and the Body Control Module (BCM) detects greater than 100k Ohms on the Headlamp Switch MUX circuit for greater than 10 seconds.

DEFAULT ACTION

- The Headlamps and Park Lamps are always on.

POSSIBLE CAUSES

Possible Causes
HEADLAMP SWITCH MUX CIRCUIT SHORTED TO VOLTAGE
HEADLAMP SWITCH MUX CIRCUIT OPEN
HEADLAMP SWITCH MUX RETURN CIRCUIT OPEN
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE HEADLAMP SWITCH HARNESS CONNECTOR - MEASURE THE VOLTAGE ON THE (L307) HEADLAMP SWITCH MUX CIRCUIT WITH THE IGNITION OFF

NOTE: Make sure the ignition is off when performing this step.

NOTE: With the ignition off, voltage should not be present on the circuit. With the ignition on, the voltage on the circuit should be approximately 5 volts.

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present with the ignition off?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L307) HEADLAMP SWITCH MUX CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.

2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L307) HEADLAMP SWITCH MUX CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE (L900) HEADLAMP SWITCH MUX RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
2. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
3. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (L307) HEADLAMP SWITCH MUX CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. With the scan tool, read the BCM DTCs.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is DTC: B178E-11-HEADLAMP SWITCH INPUT - CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [**MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1792-11-LEFT REAR LAMP DIAGNOSTIC LINE - CIRCUIT SHORT TO GROUND

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying

the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) receives a signal from the Lamp Assembly, through the Fault Sense circuit, indicating a fault is present for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
FAULT SENSE CIRCUIT SHORTED TO GROUND
LAMP ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

After a Fault Sense circuit repair is completed, or the Lamp Assembly is replaced, the Turn Lamps must be activated for at least 20 cycles, in order for the DTC status to change from Active to Stored. After the DTC status has changed to Stored, the DTC can be erased.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE LEFT TAIL LAMP ASSEMBLY FOR AN INTERNAL SHORT

1. Turn the ignition off.
2. Disconnect the Left Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Left Tail Lamp Assembly in accordance with the Service Information. Refer to **LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE (L563) LEFT REAR LIGHTING FAULT SENSE CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Check for continuity between ground and the (L563) Left Rear Lighting Fault Sense circuit at the Left Rear Lamp Assembly harness connector.

Is there continuity between ground and the (L563) Left Rear Lighting Fault Sense circuit?

Yes

- Repair the (L563) Left Rear Lighting Fault Sense circuit for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
 - Test complete.
-

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Body Control Module (BCM) - DTCS B1793-11 To B1E72-11 - Gladiator

DTC TROUBLESHOOTING

B1793-11-RIGHT REAR LAMP DIAGNOSTIC LINE - CIRCUIT SHORT TO GROUND

For a complete TURN SIGNAL LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

When the ignition is on, the Body Control Module (BCM) provides a 12-volt signal, on the Left and Right Lighting Fault Sense circuits, to the Left and Right Front Lamp Assemblies, and the Left and Right Tail Lamp Assemblies. When the Left or Right Turn Lamp is activated, the Body Control Module (BCM) provides a 12-volt signal on the Left or Right Front Turn Lamp Driver circuit, or the Left or Right Rear Turn Lamp Driver circuit, indicating the Turn Lamps have been requested.

When the Left or Right Turn Lamp is activated, an internal driver in the Front and Tail Lamp Assemblies pulls the Lighting Fault Sense circuit voltage signal low (below 6 volts), in sequence with the Turn Lamp flash. When the Turn Lamps are Off, the BCM maintains the Lighting Fault Sense circuit voltage signal high (above 8 volts).

A failure in the Lighting Fault Sense circuit may be caused by one of the following conditions:

- When the Left or Right Turn Lamps are ON, and the voltage on the Lighting Fault Sense circuit is constantly 12 volts (system voltage), may indicate the Lighting Fault Sense circuit is open or shorted to voltage, the Ground circuit is open, a poor connection or an inoperative Lamp Assembly.
- When the Left or Right Turn Lamps are OFF, the Lamp Assembly is not disconnected and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate a short to ground on the Lighting Fault Sense circuit, an internally shorted Lamp Assembly, or water/corrosion at a harness connector/terminal.
- When a Lamp Assembly is disconnected, the Lighting Fault Sense circuit is not shorted to ground, and the voltage on the Lighting Fault Sense circuit is below 6 volts, may indicate the BCM is not supplying the 12-volt signal on the Lighting Fault Sense circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) receives a signal from the Lamp Assembly, through the Fault Sense circuit, indicating a fault is present for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
FAULT SENSE CIRCUIT SHORTED TO GROUND LAMP ASSEMBLY BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

After a Fault Sense circuit repair is completed, or the Lamp Assembly is replaced, the Turn Lamps must be activated for at least 20 cycles, in order for the DTC status to change from Active to Stored. After the DTC status has changed to Stored, the DTC can be erased.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR INTERMITTENT CONDITIONS procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE RIGHT TAIL LAMP ASSEMBLY FOR AN INTERNAL SHORT

1. Turn the ignition off.
2. Disconnect the Right Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Right Tail Lamp Assembly in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE (L562) RIGHT REAR LIGHTING FAULT SENSE CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the BCM C6/F harness connector.
3. Check for continuity between ground and the (L562) Right Rear Lighting Fault Sense circuit at the Right Rear Lamp Assembly harness connector.

Is there continuity between ground and the (L562) Right Rear Lighting Fault Sense circuit?

Yes

- Repair the (L562) Right Rear Lighting Fault Sense circuit for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B17A0-2A-REAR FOG LAMP SWITCH CIRCUIT STUCK-STUCK

For a complete FOG LAMPS SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

Incandescent Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a Pulse Width Modulated (PWM) voltage output, through the Left and Right Rear Fog Lamp Feed Circuits, to the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

LED Rear Fog Lamps: When the Body Control Module (BCM) receives an input signal from the Rear Fog Lamp Switch, requesting Rear Fog Lamp illumination, the BCM provides a voltage signal, through the Left and Right Rear Fog Lamp Feed Circuits, to activate the Left and Right Rear Fog Lamps. A separate ground circuit is provided to the Left and Right Rear Fog Lamps through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects a continuous ground input signal from the Fog Lamp Switch for greater than 20 seconds.

DEFAULT ACTION

- The Rear Fog Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
HEADLAMP/FOG LAMP SWITCH SIGNAL CIRCUIT SHORTED TO GROUND FOG LAMP SWITCH

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK IF BCM DTC: B168E-11-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND IS ACTIVE

1. With the scan tool, read Body Control Module (BCM) DTCs.

Does the scan tool display DTC B168E-11-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND as active?

Yes

- Perform the diagnostic test for DTC B168E-11-FRONT FOG LAMP SWITCH-CIRCUIT SHORT TO GROUND.

No

- Inspect the Fog Lamp Switch for debris or foreign material that could cause a sticking condition. If no problem is found, replace the Fog Lamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B17AD-12-REAR LEFT TRAILER TURN LAMP CONTROL - CIRCUIT SHORT TO BATTERY

For a complete TRAILER TOW SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

Four relays are used to provide voltage to the Trailer Tow connector. The Trailer Tow Relays are used to switch fused battery voltage directly to the Trailer Tow connector when requested. The Trailer Tow Relays are activated through a ground path provided by the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Left Turn Lamps are active and the Body Control Module (BCM) detects greater than 0.95 amps on the Left Rear Turn Lamp Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Left Trailer Tow Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT REAR TURN LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT TRAILER TOW RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (L655) LEFT REAR TURN LAMP CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L655) LEFT REAR TURN LAMP CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.

4. Using a DVOM, measure the voltage on the circuit being tested at the ECU harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

4. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND](#)

INSTALLATION .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete TRAILER TOW SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Four relays are used to provide voltage to the Trailer Tow connector. The Trailer Tow Relays are used to switch fused battery voltage directly to the Trailer Tow connector when requested. The Trailer Tow Relays are activated through a ground path provided by the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Right Turn Lamps are active and the Body Control Module (BCM) detects greater than 0.95 amps on the Right Rear Turn Lamp Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Right Tailer Tow Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR TURN LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
RIGHT TRAILER TOW RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (L656) RIGHT REAR TURN LAMP CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L656) RIGHT REAR TURN LAMP CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the ECU harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

4. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17BC-11-LEFT SIDEMARKER LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Park Lamps are activated and the Body Control Module (BCM) detects greater than 0.545 amps on the Left Side Marker Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- Left Side Marker Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT SIDE MARKER CONTROL CIRCUIT SHORTED TO GROUND
LEFT SIDE MARKER LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LEFT DRL/SIDE-MARKER LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left DRL Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left DRL/Side-Marker Lamp in accordance with the Service Information. Refer to **LAMP, SIDE REPEATER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE LEFT TAIL LAMP ASSEMBLY/SIDE-MARKER LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Left Tail Lamp Assembly/Side-Marker Lamp in accordance with the Service Information. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L145) LEFT SIDE MARKER CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17C1-11-RIGHT SIDEMARKER LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete PARK LAMPS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When the Body Control Module (BCM) receives an input from the Headlamp Switch, requesting Park Lamp illumination, the BCM provides a voltage output to the Left and Right Front Lamp Assemblies, Front Signature Lamps, Tail Lamp Assemblies, License Plate Lamp and Side Marker Lamps, through the appropriate Lamp Driver circuit. A ground path is provided to the Lamp Assemblies through the wiring harness to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Park Lamps are activated and the Body Control Module (BCM) detects greater than 0.545 amps on the Right Side Marker Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- Right Side Marker Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT SIDE MARKER CONTROL CIRCUIT SHORTED TO GROUND
RIGHT SIDE MARKER LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE RIGHT DAYTIME RUNNING LAMP (DRL)/SIDE-MARKER LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right DRL Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right DRL/Side-Marker Lamp in accordance with the Service Information. Refer to **LAMP, SIDE REPEATER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE RIGHT TAIL LAMP ASSEMBLY/SIDE-MARKER LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Tail Lamp Assembly harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Right Tail Lamp Assembly/Side-Marker Lamp in accordance with the Service Information. Refer to **LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L144) RIGHT SIDE MARKER CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete TRAILER TOW SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Four relays are used to provide voltage to the Trailer Tow connector. The Trailer Tow Relays are used to switch fused battery voltage directly to the Trailer Tow connector when requested. The Trailer Tow Relays are activated through a ground path provided by the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Backup Lamps are active and the Body Control Module (BCM) detects greater than 0.95 amps on the Trailer Tow Backup Lamp Relay Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Trailer Tow Backup Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
TRAILER TOW BACKUP LAMP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
TRAILER TOW BACKUP LAMP RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (L658) TRAILER TOW BACKUP LAMP RELAY CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L658) TRAILER TOW BACKUP LAMP RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the ECU harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

4. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17F4-11-LEFT MIRROR SIGNAL LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete MIRRORS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Left Turn Lamps are activated and the Body Control Module (BCM) detects greater than 3.015 amps on the Left Front Turn Signal Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- Left Exterior Mirror Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT TURN SIGNAL CONTROL CIRCUIT SHORTED TO GROUND
LEFT EXTERIOR MIRROR TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE LEFT EXTERIOR MIRROR TURN LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Exterior Mirror Turn Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Left Exterior Mirror Turn Lamp in accordance with the Service Information. Refer to **LAMP, MIRROR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L161) LEFT FRONT TURN SIGNAL CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17F5-11-RIGHT MIRROR SIGNAL LAMP CONTROL-CIRCUIT SHORT TO GROUND

For a complete MIRRORS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Right Turn Lamps are activated and the Body Control Module (BCM) detects greater than 3.015 amps on the Right Front Turn Signal Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- Right Exterior Mirror Turn Lamp is inoperative.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT TURN SIGNAL CONTROL CIRCUIT SHORTED TO GROUND
RIGHT EXTERIOR MIRROR TURN LAMP
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE RIGHT EXTERIOR MIRROR TURN LAMP FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Exterior Mirror Turn Lamp harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Right Exterior Mirror Turn Lamp in accordance with the Service Information. Refer to [LAMP, MIRROR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L160) RIGHT FRONT SIGNAL CONTROL DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17F6-12-TRAILER TAILLAMP CONTROL - CIRCUIT SHORT TO BATTERY

For a complete TRAILER TOW SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Four relays are used to provide voltage to the Trailer Tow connector. The Trailer Tow Relays are used to switch fused battery voltage directly to the Trailer Tow connector when requested. The Trailer Tow Relays are activated through a ground path provided by the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Park Lamps are active and the Body Control Module (BCM) detects greater than 0.95 amps on the Trailer Tow Tail Lamp Relay Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Trailer Tow Park Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
TRAILER TOW TAIL LAMP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
TRAILER TOW PARK LAMP RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (L657) TRAILER TOW TAIL LAMP RELAY CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (L657) TRAILER TOW TAIL LAMP RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the ECU harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

4. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17FF-11-AMBIENT CABIN LIGHT DIMMER SWITCH - CIRCUIT SHORT TO GROUND

For a complete INTERIOR LIGHTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Dimmer Switch is integral to the Headlamp Switch. The Dimmer Switch is used to control the brightness of components that receive backlighting, such as the Instrument Panel Cluster (IPC), along with other various backlit components.

The Body Control Module (BCM) supplies and monitors a 5.0 volt reference voltage to the Headlamp/Dimmer Switch, through the Panel Lamps Driver circuit or Panel Lamps Dimmer Switch MUX Signal circuit. Based on the Headlamp/Dimmer Switch position, the BCM sets and adjusts the illumination output for the various backlit components.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Ambient Lamps are active and the Body Control Module (BCM) detects less than 50.0 Ohms, or 0.281 volts, on the Ambient Lamps Dimmer Signal circuit for greater than 10 seconds.

DEFAULT ACTION

- The Ambient Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
PANEL LAMPS DIMMER SWITCH MUX CIRCUIT SHORTED TO GROUND
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE HEADLAMP SWITCH FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Headlamp Switch harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (E3) PANEL LAMPS DIMMER SWITCH MUX CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B17FF-15-AMBIENT CABIN LIGHT DIMMER SWITCH - CIRCUIT SHORT TO BATTERY OR OPEN

For a complete INTERIOR LIGHTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Dimmer Switch is integral to the Headlamp Switch. The Dimmer Switch is used to control the brightness of components that receive backlighting, such as the Instrument Panel Cluster (IPC), along with other various backlit components.

The Body Control Module (BCM) supplies and monitors a 5.0 volt reference voltage to the Headlamp/Dimmer Switch, through the Panel Lamps Driver circuit or Panel Lamps Dimmer Switch MUX Signal circuit. Based on the Headlamp/Dimmer Switch position, the BCM sets and adjusts the illumination output for the various backlit components.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Ambient Lamps are active and the Body Control Module (BCM) detects greater than 100k Ohms, or 4.687 volts, on the Ambient Lamps Dimmer Signal for greater than 10 seconds.

DEFAULT ACTION

- The Ambient Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
PANEL LAMPS DIMMER SWITCH MUX CIRCUIT SHORTED TO VOLTAGE
PANEL LAMPS DIMMER SWITCH MUX CIRCUIT OPEN

Possible Causes
HEADLAMP SWITCH
BODY CONTROL MODULE (BCM)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE HEADLAMP SWITCH HARNESS CONNECTOR AND CHECK THE (E3) PANEL LAMPS DIMMER SWITCH MUX CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the component harness connector for the circuit being tested.
Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage above 4.687 volts?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (E3) PANEL LAMPS DIMMER SWITCH MUX CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (E3) PANEL LAMPS DIMMER SWITCH MUX CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. With the scan tool, read the BCM DTCs.

Is DTC: B17FF-11-AMBIENT CABIN LIGHT DIMMER SWITCH - CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Headlamp Switch in accordance with the Service Information. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1800-11-DRIVER DOOR LOCK-UNLOCK SWITCH-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects less than 50.0 Ohms or 0.124 volts on the Left Door Lock Switch Status circuit for greater than three seconds.

POSSIBLE CAUSES

Possible Causes
LEFT DOOR LOCK SWITCH STATUS CIRCUIT SHORTED TO GROUND DRIVER DOOR LOCK SWITCH BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE DRIVER DOOR LOCK SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.

2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Driver Door Lock Switch in accordance with the Service Information. Refer to [SWITCH, LOCK, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G161) LEFT DOOR LOCK SWITCH STATUS CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1805-11-PASSENGER DOOR LOCK-UNLOCK SWITCH-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control

circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects less than 50.0 Ohms or 0.124 volts on the Right Door Lock Switch Status circuit for greater than three seconds.

POSSIBLE CAUSES

Possible Causes
RIGHT DOOR LOCK SWITCH STATUS CIRCUIT SHORTED TO GROUND
PASSENGER DOOR LOCK SWITCH
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE PASSENGER DOOR LOCK SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Passenger Door Lock Switch in accordance with the Service Information. Refer to [SWITCH, LOCK, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G160) RIGHT DOOR LOCK SWITCH STATUS CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B180F-11- DRIVER DOOR AJAR - CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Door Latch is equipped with internal Primary and Secondary Door Ajar Switches that are monitored by the Body Control Module (BCM) and Powertrain Control Module (PCM). When the Driver Door closes, the Primary Driver Door Ajar Switch opens and the Secondary Driver Door Ajar Switch closes. When the Driver Door opens, the Primary Driver Door Ajar Switch closes and the Secondary Driver Door Ajar Switch opens. The Primary and Secondary Door Ajar Switches share a common return circuit provided by the BCM.

The BCM provides a reference voltage to the Driver Door Latch for the Primary and Secondary Driver Door Ajar Switches. The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an

internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

- When the Primary Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Primary Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.
- When the Secondary Door Ajar Switch is opened (Door is opened), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Secondary Door Ajar Switch is closed (Door is closed), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

NOTE: With the Driver Door Latch harness connector **DISCONNECTED**, the voltage measured on the Driver Door Ajar Switch Sense circuits is approximately 12.5 volts (battery voltage).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 10.0 Ohms, or 0.272 volts, on the Driver Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
DRIVER DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
DRIVER DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE DRIVER DOOR LATCH FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Driver Door Latch harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Driver Door Latch in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G75) DRIVER DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B180F-15-DRIVER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Door Latch is equipped with internal Primary and Secondary Door Ajar Switches that are monitored by the Body Control Module (BCM) and Powertrain Control Module (PCM). When the Driver Door closes, the

Primary Driver Door Ajar Switch opens and the Secondary Driver Door Ajar Switch closes. When the Driver Door opens, the Primary Driver Door Ajar Switch closes and the Secondary Driver Door Ajar Switch opens. The Primary and Secondary Door Ajar Switches share a common return circuit provided by the BCM.

The BCM provides a reference voltage to the Driver Door Latch for the Primary and Secondary Driver Door Ajar Switches. The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

- When the Primary Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Primary Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.
- When the Secondary Door Ajar Switch is opened (Door is opened), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Secondary Door Ajar Switch is closed (Door is closed), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

NOTE: With the Driver Door Latch harness connector DISCONNECTED, the voltage measured on the Driver Door Ajar Switch Sense circuits is approximately 12.5 volts (battery voltage).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 4.54 volts on the Driver Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
DRIVER DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
DRIVER DOOR AJAR SWITCH SENSE CIRCUIT OPEN
DRIVER DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. BACK-PROBE AT THE DRIVER DOOR LATCH HARNESS CONNECTOR AND MEASURE THE VOLTAGE ON THE (G75) DRIVER DOOR AJAR SWITCH SENSE CIRCUIT

1. Turn the ignition on.
2. Back-probe at the component harness connector and measure the voltage on the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage above 10.0 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE DRIVER DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G75) DRIVER DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE BCM HARNESS CONNECTORS

NOTE: The ignition may not turn on when the BCM harness connector containing the circuit being tested is disconnected. Therefore, this step can help determine if the circuit being tested is shorted to another voltage circuit in any of the BCM harness connectors.

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Disconnect all Electronic Control Unit (ECU) harness connectors, along with the component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connectors.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **6**

4. DISCONNECT THE DRIVER DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G75) DRIVER DOOR AJAR SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **5**

5. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (G75) DRIVER DOOR AJAR SWITCH SENSE CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Turn the ignition off.
2. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
3. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Turn the ignition on.
5. With the scan tool, read the BCM DTCs.

Is DTC: B180F-11-DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Driver Door Latch in accordance with the Service Information. Refer to **LATCH, DOOR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1812-11-PASSENGER DOOR AJAR-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Passenger Door Ajar Switch (integral to the Door Latch) through the Passenger Door Ajar Switch Sense circuit. On vehicles equipped with Rear Doors, the BCM also provides a reference voltage to the Rear Door Ajar Switches (integral to the Door Latches) using the Left Rear Door Ajar Switch Sense circuit and Right Rear Door Ajar Switch Sense circuit. The Passenger and Rear Door Ajar Switches share a common return circuit provided by the BCM. The Door Ajar Switches are normally open when the Doors are closed. When a Door is opened, the related Door Ajar Switch closes.

The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

When a Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.

When a Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 10.0 Ohms, or 0.272 volts, on the Passenger Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
PASSENGER DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE PASSENGER DOOR LATCH FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Passenger Door Latch harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Passenger Door Latch in accordance with the Service Information. Refer to **LATCH, DOOR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G74) PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1812-15-PASSENGER DOOR AJAR - CIRCUIT SHORT TO BATTERY OR OPEN

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Passenger Door Ajar Switch (integral to the Door Latch) through the Passenger Door Ajar Switch Sense circuit. On vehicles equipped with Rear Doors, the BCM also provides a reference voltage to the Rear Door Ajar Switches (integral to the Door Latches) using the Left Rear Door Ajar Switch Sense circuit and Right Rear Door Ajar Switch Sense circuit. The Passenger

and Rear Door Ajar Switches share a common return circuit provided by the BCM. The Door Ajar Switches are normally open when the Doors are closed. When a Door is opened, the related Door Ajar Switch closes.

The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

When a Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.

When a Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 4.54 volts on the Passenger Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT OPEN
PASSENGER DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. BACK-PROBE AT THE PASSENGER DOOR LATCH HARNESS CONNECTOR AND MEASURE THE VOLTAGE ON THE (G74) PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT

1. Turn the ignition on.
2. Back-probe at the component harness connector and measure the voltage on the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage above 10.0 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE PASSENGER DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G74) PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE BCM HARNESS CONNECTORS

NOTE: The ignition may not turn on when the BCM harness connector containing the circuit being tested is disconnected. Therefore, this step can help determine if the circuit being tested is shorted to another voltage circuit in any of the BCM harness connectors.

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Disconnect all Electronic Control Unit (ECU) harness connectors, along with the component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connectors.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

4. DISCONNECT THE PASSENGER DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G74) PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (G74) PASSENGER DOOR AJAR SWITCH SENSE CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Turn the ignition off.
2. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
3. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Turn the ignition on.
5. With the scan tool, read the BCM DTCs.

Is DTC: B1812-11-PASSENGER DOOR AJAR-CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Passenger Door Latch in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1815-11-REAR DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Passenger Door Ajar Switch (integral to the Door Latch) through the Passenger Door Ajar Switch Sense circuit. On vehicles equipped with Rear Doors, the BCM also provides a reference voltage to the Rear Door Ajar Switches (integral to the Door Latches) using the Left Rear Door Ajar Switch Sense circuit and Right Rear Door Ajar Switch Sense circuit. The Passenger and Rear Door Ajar Switches share a common return circuit provided by the BCM. The Door Ajar Switches are normally open when the Doors are closed. When a Door is opened, the related Door Ajar Switch closes.

The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

When a Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.

When a Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 50.0 Ohms, or 0.07 volts, on the Left Rear Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
LEFT REAR DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE LEFT REAR DOOR LATCH HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.

2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Left Rear Door Latch in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G77) LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1815-15-REAR DRIVER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Passenger Door Ajar Switch (integral to the Door Latch) through the Passenger Door Ajar Switch Sense circuit. On vehicles equipped with Rear Doors, the BCM also provides a reference voltage to the Rear Door Ajar Switches (integral to the Door Latches) using the Left Rear Door Ajar Switch Sense circuit and Right Rear Door Ajar Switch Sense circuit. The Passenger and Rear Door Ajar Switches share a common return circuit provided by the BCM. The Door Ajar Switches are normally open when the Doors are closed. When a Door is opened, the related Door Ajar Switch closes.

The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

When a Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.

When a Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 0.844 volts on the Left Rear Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT OPEN
LEFT REAR DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. BACK-PROBE AT THE LEFT REAR DOOR LATCH HARNESS CONNECTOR AND MEASURE THE VOLTAGE ON THE (G77) LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT

1. Turn the ignition on.

2. Back-probe at the component harness connector and measure the voltage on the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage above 10.0 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE LEFT REAR DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G77) LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE BCM HARNESS CONNECTORS

NOTE: The ignition may not turn on when the BCM harness connector containing the circuit being tested is disconnected. Therefore, this step can help determine if the circuit being tested is shorted to another voltage circuit in any of the BCM harness connectors.

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Disconnect all Electronic Control Unit (ECU) harness connectors, along with the component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connectors.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

4. DISCONNECT THE LEFT REAR DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G77) LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (G77) LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Turn the ignition off.
2. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
3. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Turn the ignition on.
5. With the scan tool, read the BCM DTCs.

Is DTC B1815-11-REAR DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Left Rear Door Latch in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1818-11-REAR PASSENGER DOOR AJAR-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Passenger Door Ajar Switch (integral to the Door Latch) through the Passenger Door Ajar Switch Sense circuit. On vehicles equipped with Rear Doors, the BCM also provides a reference voltage to the Rear Door Ajar Switches (integral to the Door Latches) using the Left Rear Door Ajar Switch Sense circuit and Right Rear Door Ajar Switch Sense circuit. The Passenger and Rear Door Ajar Switches share a common return circuit provided by the BCM. The Door Ajar Switches are normally open when the Doors are closed. When a Door is opened, the related Door Ajar Switch closes.

The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

When a Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.

When a Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 50.0 Ohms, or 0.07 volts, on the Right Rear Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
RIGHT REAR DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE RIGHT REAR DOOR LATCH HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Right Rear Door Latch in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G76) RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1818-15-REAR PASSENGER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Passenger Door Ajar Switch (integral to the Door Latch) through the Passenger Door Ajar Switch Sense circuit. On vehicles equipped with Rear Doors, the BCM also provides a reference voltage to the Rear Door Ajar Switches (integral to the Door Latches) using the Left Rear Door Ajar Switch Sense circuit and Right Rear Door Ajar Switch Sense circuit. The Passenger and Rear Door Ajar Switches share a common return circuit provided by the BCM. The Door Ajar Switches are normally open when the Doors are closed. When a Door is opened, the related Door Ajar Switch closes.

The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

When a Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.

When a Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 0.844 volts on the Right Rear Door Ajar Switch Sense circuit for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT OPEN
RIGHT REAR DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. BACK-PROBE AT THE RIGHT REAR DOOR LATCH HARNESS CONNECTOR AND MEASURE THE VOLTAGE ON THE (G76) RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT

1. Turn the ignition on.
2. Back-probe at the component harness connector and measure the voltage on the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage above 10.0 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE RIGHT REAR DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G76) RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE BCM HARNESS CONNECTORS

NOTE: The ignition may not turn on when the BCM harness connector containing the circuit being tested is disconnected. Therefore, this step can help determine if the circuit being tested is shorted to another voltage circuit in any of the BCM harness connectors.

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Disconnect all Electronic Control Unit (ECU) harness connectors, along with the component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connectors.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

4. DISCONNECT THE RIGHT REAR DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G76) RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (G76) RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Turn the ignition off.
2. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
3. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Turn the ignition on.
5. With the scan tool, read the BCM DTCS.

Is DTC B1818-11-REAR PASSENGER DOOR AJAR-CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Right Rear Door Latch in accordance with the Service Information. Refer to [**LATCH, DOOR, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B181E-13-HOOD AJAR INPUT-CIRCUIT OPEN

For a complete VEHICLE THEFT SECURITY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

NOTE: A single Hood Ajar Switch is used on vehicles without Engine Stop/Start (ESS), e-Torque or Plug-in Hybrid Electric Vehicle (PHEV). Two Hood Ajar Switches (Hood Ajar Switch 1 and Hood Ajar Switch 2) are used on vehicles with ESS, e-Torque or PHEV.

NOTE: This diagnostic procedure is for the Hood Ajar Switch or Hood Ajar Switch 1. For diagnostic information regarding Hood Ajar Switch 2. Refer to the appropriate service information .

The Body Control Module (BCM) sends the position status of the Hood Ajar Switch/Hood Ajar Switch 1, through CAN Bus messages, to the Powertrain Control Module (PCM).

The BCM monitors the hardwired Hood Ajar Switch/Hood Ajar Switch 1 through the Hood Ajar Switch Sense circuit, along with the Sensor Ground circuit.

The Hood Ajar Switch is normally open when the Hood is closed. When the Hood Ajar Switch is open, the reference voltage travels to the Hood Ajar Switch and through an internal 500.0 Ohm diagnostic resistor, which is internally parallel with the Hood Ajar Switch. The reference voltage then travels through an additional internal 500.0 Ohm resistor, within the Hood Ajar Switch. The total resistance of Hood Ajar Switch in the open position is approximately 1000.0 Ohms.

When the Hood is opened, the Hood Ajar Switch closes and the internal diagnostic resistor is bypassed. The reference voltage sent to the Hood Ajar Switch only travels through the internal resistor. The total resistance of Hood Ajar Switch in the open position is approximately 500.0 Ohms.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Hood Ajar Switch is active and the Body Control Module (BCM) detects greater than 100k Ohms, or 0.847 volts, on the Hood Ajar Switch Sense circuit for greater than 10 seconds.

DEFAULT ACTION

- The Hood Ajar indicator is inoperative.

POSSIBLE CAUSES

Possible Causes
HOOD AJAR SWITCH SENSE CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
HOOD AJAR SWITCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE HOOD AJAR SWITCH AND CHECK FOR PROPER OPERATION

1. Turn the ignition off.
2. Disconnect the Hood Ajar Switch harness connector.
3. Press the Hood Ajar Switch down and check for continuity between the two terminals at the component side of the switch.
4. Release the Hood Ajar Switch and check for continuity between the two terminals at the component side of the switch.

Is there continuity between the two terminals for both connections?

Yes

- Go To [3](#)

No

- Replace the Hood Ajar Switch in accordance with the Service Information. Refer to **SWITCH, HOOD AJAR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE VOLTAGE ON THE (G70) HOOD AJAR SWITCH SENSE CIRCUIT

1. Measure the voltage on the circuit being tested at the component harness connector.

Is the voltage above 1.0 volt?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G70) HOOD AJAR SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G931) SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B182C-11-ALL DOOR LOCK CONTROL-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Door Lock Output ON**
 - **Primary Door Locks:** When the Body Control Module (BCM) detects greater than 50.0 amps on the Door Unlock Control circuit.
 - **Secondary Door Locks:** When the BCM detects greater than 18.0 amps on the Door Unlock Control circuit.
- **Door Lock Output OFF**
 - **All Doors:** When the BCM detects less than 1.253 volts on the Door Lock Control circuit.
- The BCM will deactivate the output for the remainder of the ignition cycle after four consecutive BCM output retry attempts have failed within that ignition cycle.

DEFAULT ACTION

- Door Lock functions are inoperative.

POSSIBLE CAUSES

Possible Causes
DOOR LOCK CONTROL CIRCUIT SHORTED TO GROUND
DOOR UNLOCK CONTROL CIRCUIT SHORTED TO GROUND
DRIVER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
LEFT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
RIGHT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or component replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE DRIVER DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Driver Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Driver Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE PASSENGER DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Passenger Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Passenger Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE LEFT REAR DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Rear Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [5](#)

No

- Replace the Left Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK THE RIGHT REAR DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Rear Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [6](#)

No

- Replace the Right Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P777) DOOR LOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE (P292) DOOR UNLOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B182C-12-ALL DOOR LOCK CONTROL-CIRCUIT SHORT TO BATTERY

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Door Lock Switch is inactive and the Body Control Module (BCM) detects greater than 3.571 volts on the Door Lock Control circuit for greater than 130 milliseconds.

DEFAULT ACTION

- Door Lock functions are inoperative.

POSSIBLE CAUSES

Possible Causes
DOOR LOCK CONTROL CIRCUIT SHORTED TO VOLTAGE
DRIVER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
LEFT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)

Possible Causes
RIGHT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE DRIVER DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Driver Door Lock/Unlock Motor in accordance with the Service Information. Refer to **LATCH, DOOR, REMOVAL AND INSTALLATION**.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE PASSENGER DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Passenger Door Lock/Unlock Motor in accordance with the Service Information. Refer to **LATCH, DOOR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT THE LEFT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Left Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to **LATCH, DOOR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE RIGHT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the Right Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK THE VOLTAGE ON THE (P777) DOOR LOCK CONTROL CIRCUIT

1. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: **Make sure the Door Lock Switch is not activated while performing this step.**

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P777) DOOR LOCK CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the electronic control module (ECU) harness connector(s) for the circuit being tested.
Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the Electronic Control Unit (ECU) harness connector(s).

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B182C-13-ALL DOOR LOCK CONTROL-CIRCUIT OPEN

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- When the Door Lock Switch is active and the Body Control Module (BCM) detects greater than 1.178 volts on the Door Lock Control circuit.

DEFAULT ACTION

- Door Lock functions are inoperative.

POSSIBLE CAUSES

Possible Causes
DOOR LOCK CONTROL CIRCUIT OPEN
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To change the status of this DTC from Active to Stored, or to erase the DTC from the module's internal memory, a normal lock and unlock activation cycle must be performed. Failure to follow this step after a repair has been completed, may lead to an incorrect repair.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P777) DOOR LOCK CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

NOTE: This DTC is set when all the door lock motors are inoperative. Check for an open between the BCM, Door Latches and splices.

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms for any of the connections?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1830-11-ALL DOORS UNLOCK CONTROL-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock

Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- **Door Unlock Output ON**
 - **Driver Door:** When the Body Control Module (BCM) detects greater than 20.0 amps on the Door Unlock Control circuit.
 - **Passenger Doors:** When the BCM detects greater than 40.0 amps on the Door Unlock Control circuit.
 - **Secondary Doors:** When the BCM detects greater than 18.0 amps on the Door Unlock Control circuit.
- **Door Unlock Output OFF**
 - When the BCM detects less than 1.253 volts on the Door Unlock Control circuit.
- The BCM will deactivate the output for the remainder of the ignition cycle after four consecutive BCM output retry attempts have failed within that ignition cycle.

DEFAULT ACTION

- Door Unlock functions are inoperative.

POSSIBLE CAUSES

Possible Causes
DOOR UNLOCK CONTROL CIRCUIT SHORTED TO GROUND
DOOR LOCK CONTROL CIRCUIT SHORTED TO GROUND
PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
LEFT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
RIGHT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or component replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE DRIVER DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Driver Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Driver Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE PASSENGER DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Passenger Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Passenger Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE LEFT REAR DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Left Rear Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [5](#)

No

- Replace the Left Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK THE RIGHT REAR DOOR LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Right Rear Door Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [6](#)

No

- Replace the Right Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P292) DOOR UNLOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK THE (P777) DOOR LOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1830-12-ALL DOORS UNLOCK CONTROL-CIRCUIT SHORT TO BATTERY

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock

Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Body Control Module (BCM) detects greater than 3.571 volts on the Door Unlock Control circuit for greater than 130 milliseconds.

DEFAULT ACTION

- Door Unlock function is inoperative.

POSSIBLE CAUSES

Possible Causes
DOOR UNLOCK CONTROL CIRCUIT SHORTED TO VOLTAGE
PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
LEFT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
RIGHT REAR DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE PASSENGER DOOR UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.

2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Passenger Door Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE LEFT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Left Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE RIGHT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Right Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK FOR VOLTAGE ON THE (P292) DOOR UNLOCK CONTROL CIRCUIT

1. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: Make sure the Door Unlock Switch is not activated while performing this step.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [6](#)

No

- Go To [7](#)

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P292) DOOR UNLOCK CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Electronic Control Unit (ECU) harness connector(s) for the circuits being tested.
Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuits being tested at the Electronic Control Unit (ECU) harness connector(s).

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1834-11-DRIVER DOOR UNLOCK CONTROL-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 20.0 amperes on the Front Driver Door Unlock circuit for greater than 130 milliseconds.

DEFAULT ACTION

- Driver Door Lock/Unlock functions are inoperative.

POSSIBLE CAUSES

Possible Causes
FRONT DRIVER DOOR UNLOCK CIRCUIT SHORTED TO GROUND
DOOR LOCK CONTROL CIRCUIT SHORTED TO GROUND
DRIVER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
FRONT PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
LEFT REAR PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
RIGHT REAR PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, with the scan tool, run and save a Vehicle Scan Report and all recorded data related to the DTCs.
 3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE RIGHT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Right Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE LEFT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Left Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE PASSENGER DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Passenger Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE DRIVER DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the Driver Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P910) FRONT DRIVER DOOR UNLOCK CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE (P777) DOOR LOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [8](#)

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1834-12-DRIVER DOOR UNLOCK CONTROL-CIRCUIT SHORT TO BATTERY

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors door lock and unlock inputs from the Remote Keyless Entry FOB/IK, Driver Door Lock Switch and Passenger Door Lock Switch, through the Passive Entry Antenna or Left and Right Door Lock Switch Status circuits. The BCM provides a ground to the Door Lock Switches through the Driver and Passenger Door Lock Switch Return circuits.

Based on the door lock and unlock inputs, the BCM activates the lock and unlock functions of the bidirectional Driver, Passenger, and Rear (if equipped) Door Lock Motors (integral to the Door Latches) for 370 milliseconds, before returning to the neutral position.

Door Lock: When the Body Control Module (BCM) receives a request to lock the doors, the BCM provides a voltage signal to the Door Lock Control circuit and a ground signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the lock position.

Driver Door Unlock: When the Body Control Module (BCM) receives a request to unlock the Driver Door only, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock circuit, to actuate the Driver Door Lock Motor to the unlock position.

All Doors Unlock: When the Body Control Module (BCM) receives a request to unlock all Doors, the BCM provides a ground signal to the Door Lock Control circuit and a voltage signal to the Front Driver Door Unlock Control circuit and Door Unlock Control circuit to actuate the Driver, Passenger, and Rear Door Lock Motors to the unlock position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 3.571 volts on the Front Driver Door Unlock circuit for greater than 130 milliseconds.

DEFAULT ACTION

- Driver Door Lock/Unlock functions are inoperative.

POSSIBLE CAUSES

Possible Causes
FRONT DRIVER DOOR UNLOCK CIRCUIT SHORTED TO VOLTAGE
DOOR LOCK CONTROL CIRCUIT SHORTED TO VOLTAGE

Possible Causes
DRIVER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
FRONT PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
LEFT REAR PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
RIGHT REAR PASSENGER DOOR LOCK/UNLOCK MOTOR (INTEGRAL TO LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a Vehicle Scan Report and all recorded data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE DRIVER DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Driver Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE PASSENGER DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Passenger Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE LEFT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Left Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT THE RIGHT REAR DOOR LOCK/UNLOCK MOTOR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the Right Rear Door Lock/Unlock Motor in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P910) FRONT DRIVER DOOR UNLOCK CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. CHECK THE (P777) DOOR LOCK CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [8](#)

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B18AA-11-TRUNK-GATE UNLOCK CONTROL 1-CIRCUIT SHORT TO GROUND

For a complete DECKLID LIFTGATE LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The BCM controls the lock and unlock functions of the bidirectional Tailgate Lock Motor, integral to the Tailgate Latch, through the Tailgate Lock and Tailgate Unlock circuits.

Lock: When the Body Control Module (BCM) receives a lock request, the BCM provides voltage to the Tailgate Lock circuit and ground to the Tailgate Unlock circuit, to actuate the Tailgate Lock Motor to the lock position.

Unlock: When the Body Control Module (BCM) receives an unlock request, the BCM provides ground to the Tailgate Lock circuit and voltage to the Tailgate Unlock circuit, to actuate the Tailgate Lock Motor to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Lock Switch is active and the Body Control Module detects greater than 1.398 volts on the Tailgate Unlock circuit for greater than 130 milliseconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Tailgate Lock/Unlock function is inoperative.

POSSIBLE CAUSES

Possible Causes
TAILGATE UNLOCK CIRCUIT SHORTED TO GROUND
TAILGATE LOCK/UNLOCK MOTOR (INTEGRAL TO TAILGATE LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE TAILGATE LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Tailgate Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Tailgate Lock/Unlock Motor in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P220) TAILGATE UNLOCK CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B18CF-11-SECONDARY DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Door Latch is equipped with internal Primary and Secondary Door Ajar Switches that are monitored by the Body Control Module (BCM) and Powertrain Control Module (PCM). When the Driver Door closes, the Primary Driver Door Ajar Switch opens and the Secondary Driver Door Ajar Switch closes. When the Driver Door opens, the Primary Driver Door Ajar Switch closes and the Secondary Driver Door Ajar Switch opens. The Primary and Secondary Door Ajar Switches share a common return circuit provided by the BCM.

The BCM provides a reference voltage to the Driver Door Latch for the Primary and Secondary Driver Door Ajar Switches. The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

- When the Primary Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Primary Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.
- When the Secondary Door Ajar Switch is opened (Door is opened), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Secondary Door Ajar Switch is closed (Door is closed), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

NOTE: **With the Driver Door Latch harness connector DISCONNECTED, the voltage measured on the Driver Door Ajar Switch Sense circuits is approximately 12.5 volts (battery voltage).**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 10.0 Ohms or 0.272 volts on the Driver Door Secondary Ajar Switch Sense circuit for greater than five seconds.

DEFAULT ACTION

- The Engine Stop/Start (ESS) system or eTorque system, if equipped, is disabled.

POSSIBLE CAUSES

Possible Causes
DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
DRIVER DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE DRIVER DOOR LATCH FOR AN INTERNAL SHORT

NOTE: **Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.**

1. Turn the ignition off.
2. Disconnect the Driver Door Latch harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Driver Door Latch in accordance with the Service Information. Refer to [**LATCH, DOOR, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B18CF-15-SECONDARY DRIVER DOOR AJAR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete LOCK SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Door Latch is equipped with internal Primary and Secondary Door Ajar Switches that are monitored by the Body Control Module (BCM) and Powertrain Control Module (PCM). When the Driver Door closes, the Primary Driver Door Ajar Switch opens and the Secondary Driver Door Ajar Switch closes. When the Driver Door opens, the Primary Driver Door Ajar Switch closes and the Secondary Driver Door Ajar Switch opens. The Primary and Secondary Door Ajar Switches share a common return circuit provided by the BCM.

The BCM provides a reference voltage to the Driver Door Latch for the Primary and Secondary Driver Door Ajar Switches. The Door Ajar Switches are each equipped with an internal 604.0 Ohm resistor, along with an internal 1070.0 Ohm diagnostic resistor, which are in parallel with the internal ajar switches.

- When the Primary Door Ajar Switch is opened (Door is closed), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Primary Door Ajar Switch is closed (Door is opened), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.
- When the Secondary Door Ajar Switch is opened (Door is opened), the reference voltage travels through the 604.0 Ohm resistor and the 1070.0 Ohm diagnostic resistor.
- When the Secondary Door Ajar Switch is closed (Door is closed), the 1070.0 Ohm diagnostic resistor is bypassed and the reference voltage travels only through the 604.0 Ohm resistor.

NOTE: **With the Driver Door Latch harness connector DISCONNECTED, the voltage measured on the Driver Door Ajar Switch Sense circuits is approximately 12.5 volts (battery voltage).**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.

- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 4.54 volts on the Driver Door Secondary Ajar Switch Sense circuit for greater than five seconds.

DEFAULT ACTION

- The Engine Stop/Start (ESS) system or eTorque system, if equipped, is disabled.

POSSIBLE CAUSES

Possible Causes
DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT OPEN
DRIVER DOOR LATCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. BACK-PROBE AT THE DRIVER DOOR LATCH HARNESS CONNECTOR AND MEASURE THE VOLTAGE ON THE (G755) DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT

1. Turn the ignition on.
2. Back-probe at the component harness connector and measure the voltage on the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness

connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE DRIVER DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G755) DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE BCM HARNESS CONNECTORS

NOTE: This step checks if the circuit being tested is shorted to another voltage circuit in any of the BCM harness connectors, because the ignition may not turn on when the BCM harness connector containing the circuit being tested is disconnected.

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Disconnect all Electronic Control Unit (ECU) harness connectors, along with the component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connectors.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

4. DISCONNECT THE DRIVER DOOR LATCH AND BCM HARNESS CONNECTORS - CHECK THE (G755) DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CONNECT THE BCM HARNESS CONNECTOR(S) - CONNECT A FUSED JUMPER WIRE BETWEEN GROUND AND THE (G755) DRIVER DOOR SECONDARY AJAR SWITCH SENSE CIRCUIT - CHECK FOR ADDITIONAL DTCS

1. Connect the Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
2. Connect a fused jumper wire between ground and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. With the scan tool, read the BCM DTCS.

Is DTC B18CF-11-SECONDARY DRIVER DOOR AJAR-CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Driver Door Latch in accordance with the Service Information. Refer to [LATCH, DOOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1E01-11-MIRROR POWER SUPPLY-CIRCUIT SHORT TO GROUND

For a complete MIRRORS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Power Mirror Relay output is activated and the Body Control Module (BCM) detects a short to ground on the Power Mirror Relay Control circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

POSSIBLE CAUSES

Possible Causes
POWER MIRROR RELAY CONTROL CIRCUIT SHORTED TO GROUND
POWER MIRROR RELAY (INTEGRAL TO THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector containing the (P408) Power Mirror Relay Control circuit.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Go To [5](#)

3. CHECK THE (P408) POWER MIRROR RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Connect the negative lead of the DVOM to a known good ground.
3. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P408) POWER MIRROR RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1E01-15-MIRROR POWER SUPPLY-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete MIRRORS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Power Mirror Relay output is off and the Body Control Module (BCM) detects an open or short to voltage on the Power Mirror Relay Control circuit for greater than 1.28 seconds.

POSSIBLE CAUSES

Possible Causes
POWER MIRROR RELAY CONTROL CIRCUIT OPEN
POWER MIRROR RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY GROUND CIRCUIT OPEN
POWER MIRROR RELAY (INTEGRAL TO THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY)
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (P408) POWER MIRROR RELAY CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the Electronic Control Unit (ECU) harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P408) POWER MIRROR RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the Electronic Control Unit (ECU) harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

4. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (Z906) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit.
3. Connect the negative lead of the load test tool to the ground circuit at the PDC Assembly harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

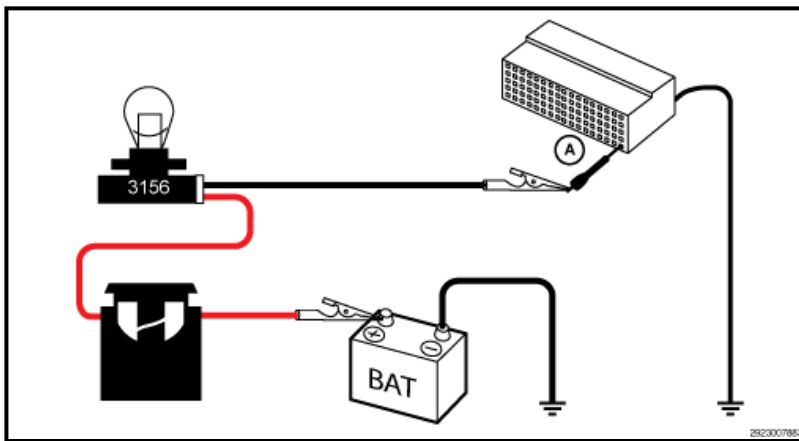
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK THE (P408) POWER MIRROR RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
4. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

6. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1E72-11 - POWER INVERTER ENABLE CONTROL-CIRCUIT SHORT TO GROUND-110V

For a complete POWER OUTLETS wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Body Control Module (BCM) monitors the Inverter Switch by providing a reference voltage to the Inverter Switch, through the Inverter Switch Signal circuit. The reference voltage travels through the Inverter Switch and back to the BCM through the Inverter Switch Return circuit.

When the Inverter Switch is in the OFF position, the internal activation switch is open. The BCM reference voltage travels through the Inverter Switch Signal circuit, to the Inverter Switch. The reference voltage continues through an internal 3.65k Ohm resistor and then through a 6.49k Ohm diagnostic resistor, which is in parallel to the internal activation switch. The remaining reference voltage travels back to the BCM through the Inverter Switch Return circuit.

When the Inverter Switch is in the ON position, the internal activation switch closes. The reference voltage travels to the Inverter Switch and through the internal 3.65k Ohm resistor, but the 6.49k Ohm diagnostic resistor is bypassed. The remaining reference voltage travels back to the BCM through the Inverter Switch Return circuit.

When the BCM detects the Inverter Switch is in the ON position, the BCM sends a signal to the Power Inverter Module (PIM) to activate the 400 Watt Alternating Current (AC) Power Outlets. The BCM communicates with

the PIM through the LIN Bus circuit. For additional information on the Power Inverter system. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Power Inverter is active and the Body Control Module (BCM) detects greater than 1.0 amp on the Inverter Switch Signal circuit.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Power Inverter is inoperative.

POSSIBLE CAUSES

Possible Causes
INVERTER SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
POWER INVERTER MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE POWER INVERTER MODULE FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Power Inverter Module harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Power Inverter Module in accordance with the Service Information. Refer to **MODULE, POWER INVERTER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P807) INVERTER SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
 - Test complete.
-

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Body Control Module (BCM) - DTCS B2103-11 To P0460-11 - Gladiator

DTC TROUBLESHOOTING

B2103-11-IGNITION RUN/START 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run/start operation is requested. The BCM provides a voltage output through the Run/Start Relay Control circuit to the coil side of the RUN/START Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN/START Relay is provided through the PDC Assembly.

WHEN MONITORED

- This diagnostic runs continuously when the Run/Start Relay output is active.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.0 amp on the Run/Start Relay Control circuit and four retry attempts have failed.

DEFAULT ACTION

- The Run/Start Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
RUN/START RELAY CONTROL CIRCUIT SHORTED TO GROUND
RUN/START RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE RUN/START RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K617) RUN/START RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested at the ECU harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K617) RUN/START RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2103-15-IGNITION RUN/START 1 CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run/start operation is requested. The BCM provides a voltage output through the Run/Start Relay Control circuit to the coil side of the RUN/START Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN/START Relay is provided through the PDC Assembly.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.5 volts on the Run/Start Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The RUN/START Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
RUN/START RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
RUN/START RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
RUN/START RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE RUN/START RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. CHECK FOR VOLTAGE ON THE (K617) RUN/START RELAY CONTROL CIRCUIT AT THE RUN/START RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [6](#)

No

- Go To [4](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K617) RUN/START RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the PDC Assembly.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [5](#)

No

- Go To [8](#)

5. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K617) RUN/START RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K617) RUN/START RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B2119-11-IGNITION RUN/ACC/SPAD CONTROL-CIRCUIT SHORT TO GROUND

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run or accessory operation is requested. The BCM provides a voltage output through the Accessory Delay 2 Relay Control circuit to the coil side of the RUN/ACCESSORY 2 Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN/ACCESSORY 2 Relay is provided through the PDC Assembly.

WHEN MONITORED

- This diagnostic runs continuously when the Run/Accessory 2 Relay output is active.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.0 amp on the Accessory Delay 2 Relay Control circuit and four retry attempts have failed.

DEFAULT ACTION

- The Run/Accessory 2 Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT SHORTED TO GROUND

Possible Causes
RUN/ACCESSORY 2 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE ACCESSORY DELAY 2 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P307) ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested at the ECU harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P307) ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to **CENTER, POWER DISTRIBUTION (PDC), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2119-15-IGNITION RUN/ACC/SPAD CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run or accessory operation is requested. The BCM provides a voltage output through the Accessory Delay 2 Relay Control circuit to the coil side of the RUN/ACCESSORY 2 Relay in the

Power Distribution Center (PDC) Assembly. A ground path for the RUN/ACCESSORY 2 Relay is provided through the PDC Assembly.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.5 volts on the Accessory Delay 2 Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Run/Accessory 2 Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT OPEN
ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
RUN/ACCESSORY 2 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE RUN/ACCESSORY 2 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR VOLTAGE ON THE (P307) ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT AT THE RUN/START RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [6](#)

No

- Go To [4](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P307) ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the PDC Assembly.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [5](#)

No

- Go To [8](#)

5. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P307) ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P307) ACCESSORY DELAY 2 RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.

2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

- Test complete.

B2121-11-IGNITION RUN CONTROL 1-CIRCUIT SHORT TO GROUND

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run operation is requested. The BCM provides a voltage output through the Run Relay Control circuit to the coil side of the RUN Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN Relay is provided through the PDC Assembly.

WHEN MONITORED

- This diagnostic runs continuously when the Run 1 Relay output is active.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.0 amp on the Ignition Run Control Output circuit and four retry attempts have failed.

DEFAULT ACTION

- The Run 1 Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
IGNITION RUN CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
RUN 1 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE RUN 1 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K619) IGNITION RUN CONTROL OUTPUT CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K619) IGNITION RUN CONTROL OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2121-15-IGNITION RUN CONTROL 1-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run operation is requested. The BCM provides a voltage output through the Run Relay Control circuit to the coil side of the RUN Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN Relay is provided through the PDC Assembly.

WHEN MONITORED

- This diagnostic runs continuously with the Run 1 Relay output inactive.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.5 volts on the Ignition Run Control Output circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Run 1 Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
IGNITION RUN CONTROL OUTPUT CIRCUIT OPEN
IGNITION RUN CONTROL OUTPUT CIRCUIT SHORTED TO VOLTAGE
RUN 1 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE RUN 1 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. CHECK FOR VOLTAGE ON THE (K619) IGNITION RUN CONTROL OUTPUT CIRCUIT AT THE RUN 1 RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [6](#)

No

- Go To [4](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K619) IGNITION RUN CONTROL OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the PDC Assembly.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [5](#)

No

- Go To [8](#)

5. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K619) IGNITION RUN CONTROL OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.

5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K619) IGNITION RUN CONTROL OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [7](#)

7. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B212E-11-IGNITION RUN/ACC CONTROL-CIRCUIT SHORT TO GROUND

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run or accessory operation is requested. The BCM provides a voltage output through the Accessory Delay 1 Relay Control circuit to the coil side of the RUN/ACCESSORY 1 Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN/ACCESSORY 1 Relay is provided through the PDC Assembly.

WHEN MONITORED

- This diagnostic runs continuously when the Run/Accessory 1 Relay output active.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.0 amp on the Accessory Delay 1 Relay Control circuit and four retry attempts have failed.

DEFAULT ACTION

- The Run/Accessory 1 Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT SHORTED TO GROUND
RUN/ACCESSORY 1 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. SUBSTITUTE THE RUN/ACCESSORY 1 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) RUN/ACCESSORY 1 RELAY AND CHECK THE (P305) ACCESSORY DELAY RELAY 1 CONTROL CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P305) ACCESSORY DELAY RELAY 1 CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B212E-15-IGNITION RUN/ACC CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) receives the network communication message from the Radio Frequency (RF Hub) Module indicating run or accessory operation is requested. The BCM provides a voltage output through the Accessory Delay 1 Relay Control circuit to the coil side of the RUN/ACCESSORY 1 Relay in the Power Distribution Center (PDC) Assembly. A ground path for the RUN/ACCESSORY 1 Relay is provided through the PDC Assembly.

WHEN MONITORED

- This diagnostic runs continuously with the Run/Accessory 1 Relay output inactive.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1.5 volts on the Accessory Delay 1 Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Run/Accessory 1 Relay is inoperative.

POSSIBLE CAUSES

Possible Causes
ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT OPEN
ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
RUN/ACCESSORY 1 RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. SUBSTITUTE THE RUN/ACCESSORY 1 RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR VOLTAGE ON THE (P305) ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT AT THE RUN/ACCESSORY 1 RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [6](#)

No

- Go To [4](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P305) ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connector(s) for the circuit being tested.
Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the PDC Assembly.

5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [5](#)

No

- Go To [8](#)

5. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P305) ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (P305) ACCESSORY DELAY 1 RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

- Test complete.

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2143-11-UGDO ENABLE CONTROL-CIRCUIT SHORT TO GROUND

For a complete UNIVERSAL TRANSMITTER wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- 10 minutes after the ignition is turned off.

SET CONDITION

- When the Wireless Transmitter/Universal Garage Door Opener (UGDO) Switch is activated and the Body Control Module (BCM) detects a short to ground on the UGDO Enable Control circuit for greater than 1.28 seconds.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The UGDO is inoperative.

POSSIBLE CAUSES

Possible Causes
UGDO ENABLE CONTROL CIRCUIT SHORTED TO GROUND
UNIVERSAL GARAGE DOOR OPENER (UGDO) MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE UNIVERSAL GARAGE DOOR OPENER (UGDO) MODULE FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Universal Garage Door Opener (UGDO) Module harness connector containing the circuit being tested.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Universal Garage Door Opener (UGDO) Module in accordance with the Service Information. Refer to [VISOR, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G38) UGDO ENABLE CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2183-11-IGNITION UNLOCK RUN-START CONTROL-CIRCUIT SHORT TO GROUND

For a complete TRANSMISSION wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects a short to ground on the Ignition Off/Run/Start Control Output circuit.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Ignition Unlock Run/Start is inoperative.

POSSIBLE CAUSES

Possible Causes
IGNITION OFF/RUN/START CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
TRANSMISSION CONTROL MODULE (TCM)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE TRANSMISSION CONTROL MODULE (TCM) FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the TCM harness connector containing the (F1) Ignition Off/Run/Start Control Output circuit.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (F1) IGNITION OFF/RUN/START CONTROL OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

4. DISCONNECT RELATED TCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all TCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all TCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Transmission Control Module (TCM) in accordance with the Service Information. Refer to **MODULE, TRANSMISSION CONTROL (TCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2193-00-INTELLIGENT BATTERY SENSOR INTERNAL

For a complete CHARGING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Intelligent Battery Sensor (IBS) is an electrical shunt with a microprocessor that is mounted in-line with the negative Battery Cable. The IBS monitors the current flow and voltage. The IBS also has a built in thermistor that calculates the Battery temperature. The microprocessor uses this data to calculate Battery state of charge, Battery internal resistance, charge received, charge delivered, and time in service. This information is reported through a LIN Bus circuit to the Body Control Module (BCM). The BCM broadcasts the information to the Powertrain Control Module (PCM) over the CAN Bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the ignition is in the RUN position and the Body Control Module (BCM) receives a LIN Bus message, for greater than five seconds, indicating an internal fault in the Intelligent Battery Sensor (IBS) exists.

DEFAULT ACTION

- Functionality related to the Intelligent Battery Sensor (IBS) is not fully operational.

POSSIBLE CAUSES

Possible Causes
INTELLIGENT BATTERY SENSOR (IBS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Visually inspect the negative battery cable connection to the Intelligent Battery Sensor (IBS) for any damage or corrosion and repair as needed. If no problems are found, replace the Intelligent Battery Sensor (IBS) in accordance with the Service Information. Refer to [**SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION**](#) [**SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**STANDARD PROCEDURE**](#) .

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete FUSES wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects the voltage is less than 9.0 volts on the Fused B(+) circuit(s) for greater than 15 seconds.

POSSIBLE CAUSES

POSSIBLE CAUSES
LOW BATTERY VOLTAGE IMPROPER BATTERY CABLE CONNECTION(S) CHARGING SYSTEM CONCERN FUSED B(+) CIRCUIT HIGH RESISTANCE BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator system output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

2. Start the Engine.
3. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to the appropriate service information .

No

- Go To [3](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (A903) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING

1. Disconnect all Electronic Control Unit (ECU) harness connectors to isolate the Fused B(+) circuits.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE:

Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for

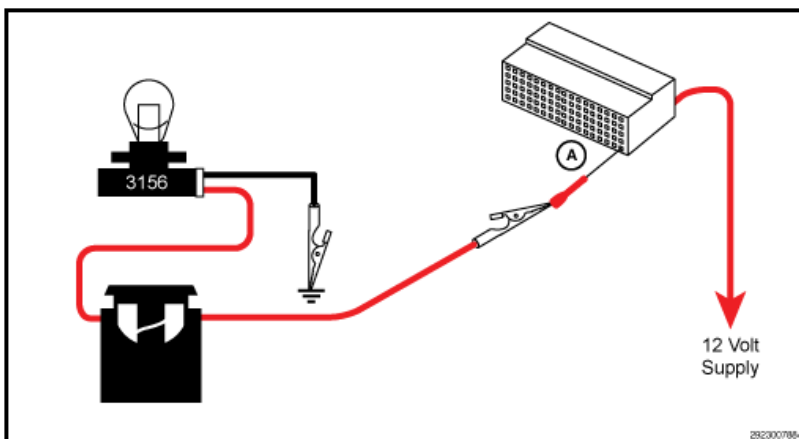
additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright for both circuits?

Yes

- Go To [4](#)

No

- Repair the Fused B(+) circuit for high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete FUSES wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects the voltage on the BCM Main Fused B(+) supply circuit(s) is greater than 16.0 volts for more than 15 seconds.

POSSIBLE CAUSES

POSSIBLE CAUSES
GENERATOR OPERATION
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.
2. Start the Engine.
3. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to the appropriate service information .

No

- Go To [3](#)

3. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B21F8-13-EXTERIOR LIGHTING POWER SUPPLY INPUT 1-CIRCUIT OPEN

For a complete FUSES wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.

- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 4.5 volts on the Fused B(+) circuit for greater than 15 seconds.

POSSIBLE CAUSES

POSSIBLE CAUSES
FUSE OPEN
FUSED B(+) CIRCUIT OPEN OR SHORT TO GROUND
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. REMOVE AND CHECK THE (A903) FUSED B(+) CIRCUIT FUSE FOR AN OPEN

NOTE: Using a suitable tool, remove the fuse or relay from the PDC Assembly by lifting upward at the middle of the component. After removal, inspect the terminals for any damage and repair, if needed.

1. Turn the ignition off.
2. Remove the fuse, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any inline connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **3**

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (A903) FUSED B(+) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .**

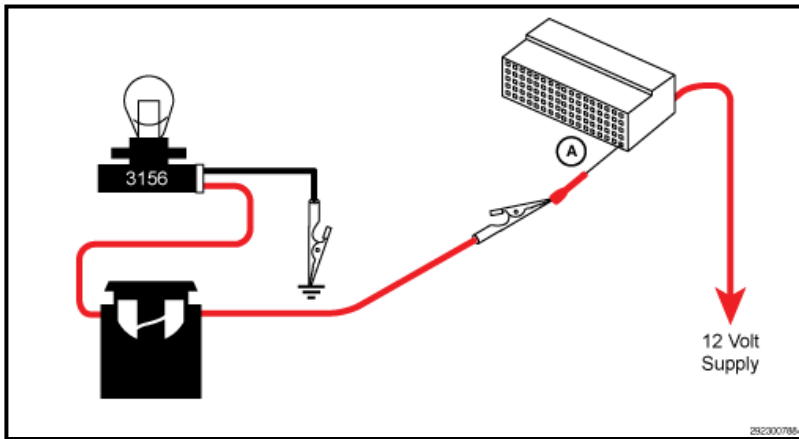
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the

CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fused B(+) circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B21F9-13-EXTERIOR LIGHTING POWER SUPPLY INPUT 2-CIRCUIT OPEN

For a complete FUSES wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 4.5 volts on the Fused B(+) circuit for greater than 15 seconds.

POSSIBLE CAUSES

POSSIBLE CAUSES
FUSE OPEN
FUSED B(+) CIRCUIT OPEN OR SHORTED TO GROUND
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. REMOVE AND CHECK THE (A904) FUSED B(+) CIRCUIT FUSE FOR AN OPEN

NOTE: Using a suitable tool, remove the fuse or relay from the PDC Assembly by lifting upward at the middle of the component. After removal, inspect the terminals for any damage and repair, if needed.

1. Turn the ignition off.
2. Remove the fuse, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any inline connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (A904) FUSED B(+) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

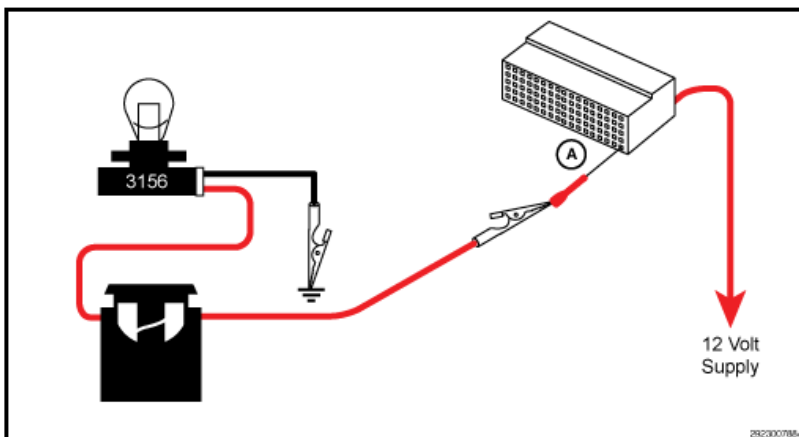
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fused B(+) circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B2204-4A-ECU CONFIGURATION MISMATCH-INCORRECT COMPONENT INSTALLED

THEORY OF OPERATION

The Body Control Module (BCM) for this vehicle can be used for different markets and vehicle content applications. In order for the BCM to function properly, the vehicle configuration information must be correctly programmed into the module when the module or certain components are replaced.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects the Headlamp Switch (for Front or Rear Fog Lamps) is not configured correctly to the vehicle.

DEFAULT ACTION

- The Front or Rear Fog Lamps are inoperative.

POSSIBLE CAUSES

Possible Causes
INCORRECT FRONT OR REAR FOG LAMP SWITCH POSITION
FRONT OR REAR FOG LAMPS NOT CONFIGURED CORRECTLY IN BCM
HEADLAMP SWITCH

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**STANDARD PROCEDURE**](#) .

2. ACTIVATE THE FRONT OR REAR (IF EQUIPPED) FOG LAMP SWITCH ON AND OFF-ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Activate the Front and Rear (if equipped) Fog Lamp Switch on and off.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

3. CONFIGURE THE HEADLAMP SWITCH (FOG LAMPS) TO THE VEHICLE - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, configure the Headlamp Switch to the vehicle.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Inspect the Headlamp Switch and make sure it is correct for the vehicle options. If the Headlamp Switch is not correct, replace the Headlamp Switch in accordance with the Service Information and repeat this step. Refer to [**SWITCH, HEADLAMP, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B2204-56-ECU CONFIGURATION MISMATCH-INVALID-INCOMPATIBLE CONFIGURATION

THEORY OF OPERATION

The Body Control Module (BCM) for this vehicle can be used for different markets and vehicle content applications. In order for the BCM to function properly, the vehicle configuration information must be correctly programmed into the module when the module or certain components are replaced.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects the Daytime Running Lamps (DRLs) are not configured correctly to the vehicle.

DEFAULT ACTION

- The DRLs are inoperative.

POSSIBLE CAUSES

Possible Causes
DAYTIME RUNNING LAMPS ARE NOT CONFIGURED CORRECTLY IN BCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- With the scan tool, configure the Body Control Module (BCM) to the Daytime Running Lamp (DRL) system that is equipped on the vehicle.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

B2206-00-CURRENT VIN MISSING/MISMATCH

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.

- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the ignition is in the Run position and the Body Control Module (BCM) detects a module on the CAN Communication Network has been replaced, but not programmed or the Vehicle Identification Number (VIN) stored in a module does not match the VIN stored in the BCM.

POSSIBLE CAUSES

Possible Causes
MODULE NOT PROGRAMMED
MODULE INSTALLED FROM ANOTHER VEHICLE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Verify the Vehicle Identification Number (VIN) for all modules matches the VIN of the vehicle.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- **A module was not recently replaced:** With the scan tool, configure the modules with the vehicle.
- **A module was recently replaced:** If available, perform the programming procedure for the module(s) in accordance with the Service Information. With the scan tool, configure the modules with the vehicle.
- **A module was replaced from another vehicle:** Replace the module with a module that is correct for the vehicle.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

THEORY OF OPERATION

The Body Control Module (BCM) for this vehicle can be used for different markets and vehicle content applications. In order for the BCM to function properly, the vehicle configuration information must be correctly programmed into the module when the module or certain components are replaced.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) is not configured correctly to the vehicle.

DEFAULT ACTION

- Various BCM outputs are inoperative.

POSSIBLE CAUSES

Possible Causes
BCM NOT CONFIGURED CORRECTLY BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CONFIGURE THE BCM TO THE VEHICLE - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, configure the BCM to the vehicle.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.

5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read the BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

3. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B225C-00-COMPASS MODULE INTERNAL

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module receives a message through the LIN Bus 2 circuit indicating the Compass Module has an internal fault for greater than 3 seconds.

DEFAULT ACTION

- Functionality related to the Compass Module is not fully operational.

POSSIBLE CAUSES

Possible Causes
COMPASS MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Replace the Compass Module in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

B2267-00-INTERIOR REAR VIEW MIRROR MODULE INTERNAL

For a complete MIRRORS wiring diagram, **Refer to the appropriate wiring information .**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position for greater than five seconds.
- The battery voltage is between 9.0 and 16.0 volts.

SET CONDITION

- The Inside Rear View Mirror reports to the Body Control Module (BCM) that an internal failure exists.

DEFAULT ACTION

- Functionality related to Inside Rear View Mirror is not fully operational.

POSSIBLE CAUSES

Possible Causes
INSIDE REAR VIEW MIRROR

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Replace the Inside Rear View Mirror in accordance with the Service Information. Refer to [MIRROR, REARVIEW, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

B2303-11-WIPER PARK SWITCH INPUT-CIRCUIT SHORT TO GROUND

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects the Front Wiper Switch is activated and the Front Wiper Park Switch is closed for greater than 10 seconds.

DEFAULT ACTION

- The Front Wipers are inoperative.

POSSIBLE CAUSES

Possible Causes
ADDITIONAL DTCS
FUSE OPEN
WIPER LOW SPEED CONTROL OUTPUT CIRCUIT OPEN
WIPER HIGH SPEED CONTROL OUTPUT CIRCUIT OPEN
FRONT WIPER PARK SWITCH SENSE CIRCUIT SHORTED TO GROUND
FRONT WIPER MOTOR
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: Repair any other Front Wiper related DTCs before performing this diagnostic procedure.

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- The condition or conditions that originally set this DTC are not present at this time. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals and correct pin tension. If no problems are found, test complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

2. CHECK FUSE 27 (30A) FOR AN OPEN

1. Remove Fuse 27 (30A) from the Power Distribution Center (PDC) Assembly.
2. Inspect Fuse 27 (30A) for an open.

Is Fuse 27 (30A) open?

Yes

- Replace Fuse 27 (30A) and operate the Front Wiper Motor.
- **If Fuse 27 (30A) Opens:** Go To [2](#)

- **If Fuse 27 (30A) Does Not Open:** Restart the diagnostic test. Go To [1](#)

No

- Install Fuse 25 (30A) and Go To [3](#)

3. CHECK THE WIPER HIGH/LOW SPEED RELAY OUTPUT ON THE (W3) WIPER LOW SPEED CONTROL OUTPUT CIRCUIT

1. Turn the ignition off.
2. Disconnect the Front Wiper Motor harness connector.
3. Turn the ignition on.
4. Turn the Front Wipers on, at Low Speed.
5. With a 12-volt test light connected to ground, check the (W3) Wiper Low Speed Control Output circuit at the Front Wiper Motor harness connector.

Does the test light illuminate brightly when compared to the test light connected to the Battery?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK THE WIPER HIGH/LOW SPEED RELAY OUTPUT ON THE (W4) WIPER HIGH SPEED CONTROL OUTPUT CIRCUIT

1. Turn the Front Wipers on, at High Speed.
2. With a 12-volt test light connected to ground, check the (W4) Wiper High Speed Control Output circuit at the Front Wiper Motor harness connector.

Does the test light illuminate brightly when compared to the test light connected to the Battery?

Yes

- Go To [7](#)

No

- Go To [6](#)

5. CHECK THE (W3) WIPER LOW SPEED CONTROL OUTPUT CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly C5 harness connector.
3. Measure the resistance of the (W3) Wiper Low Speed Control Output circuit between the Front Wiper Motor harness connector and the Power Distribution Center (PDC) Assembly C5 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open in the (W3) Wiper Low Speed Control Output circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [9](#)

6. CHECK THE (W4) WIPER HIGH SPEED CONTROL OUTPUT CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) Assembly C5 harness connector.
3. Measure the resistance of the (W4) Wiper High Speed Control Output circuit between the Front Wiper Motor harness connector and the Power Distribution Center (PDC) Assembly C5 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open in the (W4) Wiper High Speed Control Output circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [9](#)

7. CHECK FOR CONTINUITY TO GROUND ON THE (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT

1. Turn the ignition off.
2. Check for continuity between ground and the (W7) Front Wiper Park Sense circuit at the Front Wiper Motor harness connector.

Is there continuity between ground and the (W7) Front Wiper Park Sense circuit?

Yes

- Go To [8](#)

No

- Replace the Front Wiper Motor in accordance with the Service Information. Refer to **MOTOR, WIPER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. CHECK THE (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. Disconnect the BCM C1/A harness connector.
2. Check for continuity between ground and the (W7) Front Wiper Park Sense circuit at the Front Wiper Motor harness connector.

Is there continuity between ground and the (W7) Front Wiper Park Sense circuit?

Yes

- Repair the short to ground in the (W7) Front Wiper Park Switch Sense circuit.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

9. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

10. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2303-13-WIPER PARK SWITCH INPUT-CIRCUIT OPEN

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects the Front Wiper Switch is off and the Front Wiper Park Switch is open for greater than 10 seconds.
- When the Body Control Module (BCM) detects the Front Wiper Switch is activated and the Front Wiper Park Switch does not switch from an open to a ground during a Wiper Motor cycle.

DEFAULT ACTION

- The Front Wipers are always on or inoperative.

POSSIBLE CAUSES

Possible Causes
FUSE MISSING OR OPEN
FRONT WIPER PARK SWITCH SENSE CIRCUIT OPEN
WIPER ON/OFF RELAY
WIPER HIGH/LOW RELAY
FRONT WIPER MOTOR
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after any wiring repair or component/module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK FUSE F27 (30A) FOR AN OPEN

NOTE: **When removing a fuse from the PDC Assembly, do not rock or wiggle the fuse sideways during removal. Lift the fuse upward, using fingers or suitable pliers, at the middle of the fuse body and inspect the fuse terminals for proper contact.**

1. Turn the ignition off.
2. Remove the fuse, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Check the fuse for an open.

Is the fuse open?

Yes

- Replace the fuse and check the system operation. If the fuse continues to open, repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Install the fuse and Go To [3](#)

3. SUBSTITUTE THE WIPER ON/OFF RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: **When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.**

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. SUBSTITUTE THE WIPER HIGH/LOW RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. DISCONNECT THE FRONT WIPER MOTOR HARNESS CONNECTOR - CONNECT A JUMPER WIRE BETWEEN GROUND AND THE (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT - CHECK FOR ADDITIONAL DTCs

1. Turn the ignition off.
2. Disconnect the Front Wiper Motor harness connector.
3. Connect a fused jumper wire between ground and the (W7) Front Wiper Park Switch Sense circuit at the Front Wiper Motor harness connector.
4. Turn the ignition on.
5. Turn the Wiper Switch on.
6. With the scan tool, read the BCM DTCs.

Is DTC: B2303-11-WIPER PARK SWITCH INPUT-CIRCUIT SHORT TO GROUND active?

Yes

- Go To [7](#)

No

- Go To [6](#)

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the BCM C1/A harness connector.
3. Measure the resistance of the (W7) Front Wiper Park Switch Sense circuit between the Front Wiper Motor harness connector and BCM C1/A harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (W7) Front Wiper Park Switch Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

7. CHECK FOR VOLTAGE ON THE (W3) WIPER LOW SPEED CONTROL OUTPUT CIRCUIT AND (W4) WIPER HIGH SPEED CONTROL OUTPUT CIRCUIT

NOTE: **Make sure the Wiper Switch is in the OFF position when performing this step.**

1. Turn the Wiper Switch off.
2. Make sure the ignition is on.
3. Measure the voltage on the (W3) Wiper Low Speed Control Output Circuit at the Front Wiper Motor harness connector.
4. Measure the voltage on the (W4) Wiper High Speed Control Output Circuit at the Front Wiper Motor harness connector.

Is there any voltage present at any of the connections?

Yes

- Go To [8](#)

No

- Replace the Front Wiper Motor in accordance with the Service Information. Refer to **MOTOR, WIPER, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR - CHECK FOR VOLTAGE ON THE (W3) WIPER LOW SPEED CONTROL OUTPUT CIRCUIT AND (W4) WIPER HIGH SPEED CONTROL OUTPUT CIRCUIT

1. Turn the ignition off.
2. Disconnect the PDC Assembly C1 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the (W3) Wiper Low Speed Control Output circuit at the Front Wiper Motor harness connector.
5. Measure the voltage on the (W4) Wiper High Speed Control Output circuit at the Front Wiper Motor harness connector.

Is there any voltage present at any of the connections?

Yes

- Repair the circuit(s) for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [9](#)

9. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

10. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2312-11-WIPER ON/OFF CONTROL-CIRCUIT SHORT TO GROUND

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Front Wiper Switch is active and the Body Control Module (BCM) detects a short to ground on the Wiper On/Off Relay Control circuit.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Front Wipers are inoperative.

POSSIBLE CAUSES

Possible Causes
WIPER ON/OFF RELAY CONTROL CIRCUIT SHORTED TO GROUND
WIPER ON/OFF RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after any wiring repair or component/module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. SUBSTITUTE THE WIPER ON/OFF RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE WIPER ON/OFF RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2312-15-WIPER ON/OFF CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Front Wiper Switch is off and the Body Control Module (BCM) detects an open or short to voltage on the Wiper On/Off Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Front Wipers are inoperative.

POSSIBLE CAUSES

Possible Causes
WIPER ON/OFF RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
WIPER ON/OFF RELAY CONTROL CIRCUIT OPEN
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY GROUND CIRCUIT OPEN
WIPER ON/OFF RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. SUBSTITUTE THE WIPER ON/OFF RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR VOLTAGE ON THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT AT THE WIPER ON/OFF RELAY TERMINAL

NOTE: Make sure the Wiper Switch is in the Off position when performing this step.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.

4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [10](#)

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [11](#)

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) - CHECK THE RESISTANCE ON THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT BETWEEN THE BCM AND WIPER ON/OFF RELAY TERMINAL

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the PDC Assembly.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (W8) WIPER ON/OFF RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

8. CHECK THE PDC ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT AT THE WIPER ON/OFF RELAY TERMINAL

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit.
3. Connect the negative lead of the load test tool to the ground circuit at the relay terminal in the PDC Assembly.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [11](#)

No

- Go To [9](#)

9. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE PDC ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

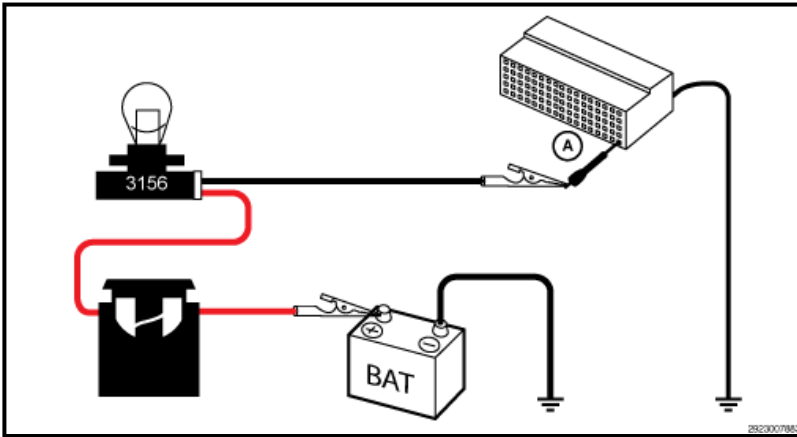
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the

CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [10](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

10. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

11. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2316-11-WIPER HIGH/LOW CONTROL-CIRCUIT SHORT TO GROUND

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Front Wiper Switch is active and the Body Control Module (BCM) detects greater than 1.0 amp on the Wiper High/Low Relay Control circuit for greater than four seconds.

DEFAULT ACTION

- The Front Wipers are inoperative.

POSSIBLE CAUSES

Possible Causes
WIPER HIGH/LOW RELAY CONTROL SHORTED TO GROUND
WIPER HIGH/LOW RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. SUBSTITUTE THE WIPER HIGH/LOW RELAY - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE WIPER HIGH/LOW RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to **CENTER, POWER DISTRIBUTION (PDC), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2316-15-WIPER HIGH/LOW CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Front Wiper Switch is off and the Body Control Module (BCM) detects greater than 1.5 volts on the Wiper High/Low Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Front Wipers are inoperative.

POSSIBLE CAUSES

Possible Causes
WIPER HIGH/LOW RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
WIPER HIGH/LOW RELAY CONTROL CIRCUIT OPEN
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY GROUND CIRCUIT OPEN
WIPER HIGH/LOW RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. SUBSTITUTE THE WIPER HIGH/LOW RELAY - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

NOTE: When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR VOLTAGE ON THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT AT THE WIPER HIGH/LOW RELAY TERMINAL

NOTE: Make sure the Wiper Switch is in the Off position when performing this step.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [10](#)

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [11](#)

6. DISCONNECT THE BCM HARNESS CONNECTOR(S) - CHECK THE RESISTANCE ON THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT BETWEEN THE BCM AND WIPER HIGH/LOW RELAY TERMINAL

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the PDC Assembly.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (W2) WIPER HIGH/LOW RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [10](#)

8. CHECK THE PDC ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT AT THE WIPER HIGH/LOW RELAY TERMINAL

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit.
3. Connect the negative lead of the load test tool to the ground circuit at the relay terminal in the PDC Assembly.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [11](#)

No

- Go To [9](#)

9. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE PDC ASSEMBLY GROUND CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

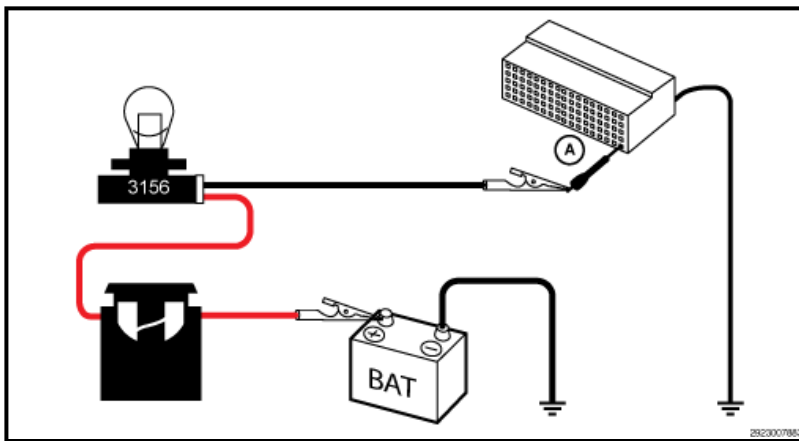
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [10](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

10. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

11. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2335-11-HORN CONTROL-CIRCUIT SHORT TO GROUND

For a complete HORNS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When Horn operation is requested, the Body Control Module (BCM) either receives a hard-wire signal from the Horn Switch, through the Steering Column Control Module (SCCM), or a CAN Bus message from the RF-Hub (Radio Frequency Hub) Module. When the normally open Horn Switch is depressed, the Horn Switch closes and a ground signal is sent through the Horn Switch Sense circuit, to the BCM.

When the BCM receives the request for Horn operation, the BCM provides a voltage output to the coil side of the Horn Relay, integral to the Power Distribution Center (PDC) Assembly, through the Horn Relay Control circuit. A ground path for the Horn Relay is provided through the PDC Assembly. When the Horn Relay is active, a voltage output is provided through the Fused Horn Control Output circuit, to the Horn. A ground path for the Horn is provided through the wiring harness, to the body sheet metal.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Horn Switch is activated and the Body Control Module (BCM) detects greater than 1.0 amp on the Horn Relay Control circuit.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Horn is inoperative.

POSSIBLE CAUSES

Possible Causes
HORN RELAY CONTROL CIRCUIT SHORTED TO GROUND
HORN RELAY (INTEGRAL TO THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR AND CHECK THE (X4) HORN RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.**

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (X4) HORN RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.

2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

4. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2335-15-HORN CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HORNS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

When Horn operation is requested, the Body Control Module (BCM) either receives a hard-wire signal from the Horn Switch, through the Steering Column Control Module (SCCM), or a CAN Bus message from the RF-Hub (Radio Frequency Hub) Module. When the normally open Horn Switch is depressed, the Horn Switch closes and a ground signal is sent through the Horn Switch Sense circuit, to the BCM.

When the BCM receives the request for Horn operation, the BCM provides a voltage output to the coil side of the Horn Relay, integral to the Power Distribution Center (PDC) Assembly, through the Horn Relay Control circuit. A ground path for the Horn Relay is provided through the PDC Assembly. When the Horn Relay is active, a voltage output is provided through the Fused Horn Control Output circuit, to the Horn. A ground path for the Horn is provided through the wiring harness, to the body sheet metal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Horn Switch is off and the Body Control Module (BCM) detects greater than 1.5 volts on the Horn Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Horn is inoperative.

POSSIBLE CAUSES

Possible Causes
HORN RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
HORN RELAY CONTROL CIRCUIT OPEN
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY GROUND CIRCUIT OPEN
HORN RELAY (INTEGRAL TO THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK FOR VOLTAGE ON THE (X4) HORN RELAY CONTROL CIRCUIT

1. Turn the ignition off.
2. Disconnect the BCM harness connector(s) for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the BCM harness connector(s).

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (X4) HORN RELAY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector(s).

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

4. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (X4) HORN RELAY CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all PDC Assembly harness connector(s) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the BCM harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

5. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B233D-11-FRONT/REAR WASHER MOTOR (+) CONTROL-CIRCUIT SHORT TO GROUND

For a complete WIPER WASHER SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

FRONT WIPERS:

The Front Wiper Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Wiper Switch commands through the CAN C Bus, to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Wiper Motor at low speed, the BCM provides voltage through the Wiper On/Off Relay Control circuit, to energize the coil side of the Wiper On/Off Relay, located in the Power Distribution Center (PDC) Assembly. When the Wiper On/Off Relay is active, a voltage output is sent through the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper Low Speed Control Output circuit, which activates the Front Wiper Motor at low speed.

When the BCM receives a message to activate the Front Wiper Motor at high speed, the BCM provides voltage through the Wiper High/Low Relay Control circuit, to energize the coil side of the Wiper High/Low Relay. When the Wiper High/Low Relay is active, a voltage output is sent from the Wiper High/Low Relay to the Front Wiper Motor, through the Wiper High Speed Control Output circuit, which activates the Front Wiper Motor at high speed.

A ground path for the Front Wiper Motor is provided through the wiring harness to the body of the vehicle.

WIPER PARK SWITCH:

The Body Control Module (BCM) provides a battery reference voltage on the Front Wiper Park Switch Sense circuits, through an internal pull-up resistor, to the Front Wiper Motor. The Wiper Park Switch is integral to the Front Wiper Motor and switch the Front Wiper Park Switch Sense circuit from open to ground as the Front Wiper Motor rotates.

WASHER PUMP MOTOR:

The Front Washer Switch is part of the Right Multifunction Switch, which is integral to the Steering Column Control Module (SCCM). The SCCM sends Front Washer Switch commands through the CAN C Bus to the Body Control Module (BCM).

The Front Camera Switch is part of the Integrated Center Stack (ICS), which sends Front Washer Switch commands through the CAN IHS Bus to the Body Control Module (BCM).

When the BCM receives a message to activate the Front Washers, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Washer Pump Motor Control circuit, and a ground path through the Front Camera Washer Pump Motor Control circuit.

When the BCM receives a message to activate the Front Camera Washer, the BCM provides a voltage signal to the Washer Pump Motor, through the Front Camera Washer Pump Motor Control circuit, and a ground path through the Front Washer Pump Motor Control circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Front Washer Pump Switch is active and the Body Control Module (BCM) detects greater than 22.0 amps on the Front Washer Pump Motor Control circuit.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Washer Pump Motor is inoperative.

POSSIBLE CAUSES

Possible Causes
OPEN FUSE FUSED B(+) CIRCUIT SHORTED TO GROUND FRONT WASHER PUMP MOTOR CONTROL CIRCUIT SHORTED TO GROUND WASHER PUMP MOTOR POWER DISTRIBUTION CENTER (PDC) ASSEMBLY BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module’s internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. REMOVE AND INSPECT FUSE F27 (30A) FOR AN OPEN

NOTE: When this DTC is Active, it cannot be erased until the Washer Pump Motor is activated and the Body Control Module detects a lower amperage draw than what is specified in Set Conditions.

1. Turn the ignition off.
2. Remove Fuse F27 (30A) from the Power Distribution Center (PDC) Assembly.
3. Inspect Fuse F27 (30A) for an open.

Is Fuse F27 (30A) open?

Yes

- Replace Fuse F27 (30A). If the fuse continues to open, inspect and repair the (A237) Fused B(+) circuit for a short to ground. If no problems are found, replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE WASHER PUMP MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Washer Pump Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Washer Pump Motor in accordance with the Service Information. Refer to [PUMP, WINDSHIELD WASHER, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (W10) FRONT WASHER PUMP MOTOR CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B23B8-2A-BRAKE PEDAL SWITCH-STUCK

For a complete BRAKE SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Body Control Module (BCM) detects the Stop Lamp Sensor has been consistently activated for greater than eight minutes.

POSSIBLE CAUSES

Possible Causes
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE DTCS
STOP LAMP SENSOR ADJUSTMENT
STOP LAMP SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
4. With the scan tool, read Body Control Module (BCM) DTCS.

Is the DTC Active?

Yes

- If there are previous complaints of the Stop Lamps always on, or the Speed Control will not activate, Go To [2](#)

No

- If the Stop Lamps and Speed Control system operate correctly, perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK FOR STOP LAMP SENSOR RELATED DTC(S) PRESENT IN THE ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

1. Turn the ignition on.
2. With the scan tool, read ABS Module DTCs and record on the repair order.

Are there any Stop Lamp Sensor related DTCs present?

Yes

- Repair the ABS Module DTCs before continuing with this test. Refer to [DIAGNOSIS AND TESTING](#) .

No

- Go To [3](#)

3. CHECK FOR AN IMPROPERLY INSTALLED STOP LAMP SENSOR

1. Turn the ignition off.
2. Check the Stop Lamp Sensor for proper installation, damage, or mechanical failure in accordance with the Service Information.

Were any problems found?

Yes

- Repair as necessary and perform the "Brake Pedal Sensor Calibration" routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. COMPARE THE BRAKE PEDAL TRAVEL SENSOR SETPOINT TO THE BRAKE PEDAL POSITION

NOTE: **The voltage of the Brake Pedal Travel Sensor Setpoint and Brake Pedal Position should be equal.**

1. Start the engine.
2. With the scan tool, in ABS Data, compare the Brake Pedal Travel Sensor Setpoint voltage to the Brake Pedal Position voltage.

Is the voltage difference between the ABS Data greater than 0.2 volts?

Yes

- Perform the "Brake Pedal Sensor Calibration" routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Stop Lamp Sensor in accordance with the Service Information. Refer to [SENSOR, STOP LAMP, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B259F-11-TRUNK/LIFTGATE LOCK CONTROL CIRCUIT-CIRCUIT SHORT TO GROUND

For a complete DECKLID LIFTGATE LOCK SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

The BCM controls the lock and unlock functions of the bidirectional Tailgate Lock Motor, integral to the Tailgate Latch, through the Tailgate Lock and Tailgate Unlock circuits.

Lock: When the Body Control Module (BCM) receives a lock request, the BCM provides voltage to the Tailgate Lock circuit and ground to the Tailgate Unlock circuit, to actuate the Tailgate Lock Motor to the lock position.

Unlock: When the Body Control Module (BCM) receives an unlock request, the BCM provides ground to the Tailgate Lock circuit and voltage to the Tailgate Unlock circuit, to actuate the Tailgate Lock Motor to the unlock position.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Lock Switch is active and the Body Control Module detects greater than 1.398 volts on the Tailgate Lock circuit for greater than 130 milliseconds.
 - Four consecutive BCM output retry attempts have failed within the same ignition cycle.

DEFAULT ACTION

- The Tailgate Lock/Unlock function is inoperative.

POSSIBLE CAUSES

Possible Causes
TAILGATE LOCK CIRCUIT SHORTED TO GROUND
TAILGATE LOCK/UNLOCK MOTOR (INTEGRAL TO TAILGATE LATCH)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: To erase this DTC from the module's internal memory, the Body Control Module (BCM) must detect an ignition OFF/ON cycle, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE TAILGATE LOCK/UNLOCK MOTOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

1. Turn the ignition off.
2. Disconnect the Tailgate Lock/Unlock Motor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Tailgate Lock/Unlock Motor in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (P221) TAILGATE LOCK CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

For a complete BRAKE SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Body Control Module (BCM) provides a reference voltage to the Brake Fluid Level Switch, through the Brake Fluid Level Signal circuit. When the brake fluid level is above the low level switch, the Brake Fluid Level Switch is opened and the reference voltage travels through an internal 10k Ohm diagnostic resistor which is parallel to the internal Brake Fluid Level Switch. When the brake fluid level is below the low level switch, the Brake Fluid Level Switch closes and the reference voltage bypasses the diagnostic resistor.

When the BCM detects the brake fluid level is low, the BCM sends a CAN Bus message to the Instrument Cluster (IC), in order to illuminate the BRAKE warning lamp.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 100k Ohms on the Brake Fluid Level Signal for greater than 10 seconds.

DEFAULT ACTION

- Brake Fluid Level indicator is activated.

POSSIBLE CAUSES

Possible Causes
BRAKE FLUID LEVEL SIGNAL CIRCUIT OPEN
GROUND CIRCUIT OPEN
BRAKE FLUID LEVEL SWITCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE BRAKE FLUID LEVEL SWITCH HARNESS CONNECTOR - CONNECT A FUSED JUMPER WIRE BETWEEN THE (Z420) GROUND CIRCUIT AND THE (B20) BRAKE FLUID LEVEL SIGNAL CIRCUIT - CHECK THE BCM DATA

1. Turn the ignition off.
2. Disconnect the component harness connector(s) for the circuit being tested.
3. Connect a fused jumper wire between the ground circuit and the circuit being tested at the component harness connector. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Turn the ignition on.
5. With the scan tool, read the Brake Fluid Level data.

Does the Brake Fluid Level data display Low?

Yes

- Replace the Brake Fluid Level Switch in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR AND CHECK THE (B20) BRAKE FLUID LEVEL SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

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4. CHECK THE (Z420) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
4. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

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5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0070-11-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Body Control Module (BCM) detects less than 77.0 Ohms on the Ambient Air Temperature Signal circuit for greater than 10 seconds.

DEFAULT ACTION

- Temperature display defaults to the maximum limit.

POSSIBLE CAUSES

Possible Causes
AMBIENT AIR TEMPERATURE (AAT) SIGNAL CIRCUIT SHORTED TO GROUND
AAT SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
AMBIENT AIR TEMPERATURE (AAT) SENSOR
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: After repairing an Ambient Air Temperature (AAT) Sensor circuit, or replacing the AAT Sensor, the vehicle **MUST** be driven above 15 mph (24 km/h), for at least five minutes. Performing this allows the AAT Sensor data in the BCM to be updated. Failure to perform this may lead to the incorrect replacement of the BCM.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE AMBIENT AIR TEMPERATURE (AAT) SENSOR FOR AN INTERNAL SHORT

NOTE: Additional DTCs may set when the harness connector is disconnected and the ignition is positioned on. After all repairs are completed, make sure to erase any additional DTCs that may have set.

NOTE: The AAT Sensor operates between 345, 260 Ohms (low temperature) and 181 Ohms (high temperature).

At 20Â°C (68Â°F) the AAT Sensor resistance should be between 11, 370 Ohms and 13, 610 Ohms.

1. Turn the ignition off.
2. Disconnect the Ambient Air Temperature (AAT) Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is the DTC Active?

Yes

- Go To [3](#)

No

- Replace the Ambient Air Temperature (AAT) Sensor in accordance with the Service Information. Refer to [SENSOR, AMBIENT TEMPERATURE, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G31) AAT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE (G31) AAT SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE (G931) SENSOR GROUND CIRCUIT

1. The ignition must be off when checking a circuit for continuity.
2. Connect the negative lead of the DVOM to one of the circuits being tested at the ECU or component harness connector.
3. Connect the positive lead of the DVOM to the other circuit being tested at the ECU or component harness connector and check for continuity between the circuits.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits being tested?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0070-15-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Body Control Module (BCM) detects greater than 880, 000 Ohms on the Ambient Air Temperature Signal circuit for greater than 10 seconds.

DEFAULT ACTION

- Temperature display defaults to the minimum limit.

POSSIBLE CAUSES

Possible Causes
AMBIENT AIR TEMPERATURE (AAT) SIGNAL CIRCUIT SHORTED TO VOLTAGE
AAT SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
AMBIENT AIR TEMPERATURE (AAT) SENSOR
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: After repairing an Ambient Air Temperature (AAT) Sensor circuit, or replacing the AAT Sensor, the vehicle **MUST** be driven above 15 mph (24 km/h), for at least five minutes. Performing this allows the AAT Sensor data in the BCM to be updated. Failure to perform this may lead to the incorrect replacement of the BCM.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE AMBIENT AIR TEMPERATURE HARNESS CONNECTOR AND CHECK THE (G31) AAT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the component harness connector(s) for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage above 5.2 volts?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CONNECT A FUSED JUMPER WIRE BETWEEN THE (G31) AAT SENSOR SIGNAL CIRCUIT AND (G931) SENSOR GROUND CIRCUIT - CHECK FOR ADDITIONAL DTCS

NOTE: The AAT Sensor operates between 345, 260 Ohms (low temperature) and 181 Ohms (high temperature).

At 20°C (68°F) the AAT Sensor resistance should be between 11, 370 Ohms and 13, 610 Ohms.

1. Turn the ignition off.
2. Connect a fused jumper wire between the circuits being tested at the component harness connector.
Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. With the scan tool, read the BCM DTCs.

Is DTC: P0070-11-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT - CIRCUIT SHORT TO GROUND active?

Yes

- Replace the Ambient Air Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, AMBIENT TEMPERATURE, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (G31) AAT SENSOR SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE (G931) SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

4. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

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6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0460-11-FUEL LEVEL SENSOR 1 - CIRCUIT SHORT TO GROUND

For a complete FUEL DELIVERY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) helps determine the amount of fuel remaining in the Fuel Tank by monitoring the Fuel Level Sensor and sending CAN Bus fuel level messages to the modules that require fuel level information. The BCM monitors the Fuel Level Sensor through hardwired Fuel Level Sensor Signal and Fuel Level Sense Return circuits. The Fuel Level Sensor includes a Fuel Level Sensor Arm and Float, along with an integral variable resistor, which operates between 51.0 Ohms and 992.0 Ohms. The resistance value of the Fuel Level Sensor varies, depending on the amount of fuel remaining in the Fuel Tank. When the Fuel Level Sensor Arm and Float is at the highest point of travel (Fuel Tank FULL), the resistance is approximately 51.0 Ohms. When the Fuel Level Sensor Arm and Float is at the lowest point of travel (Fuel Tank EMPTY), the resistance is approximately 992.0 Ohms.

On a normally functioning system, with no circuit faults and the harness connectors plugged in, the voltage on the Fuel Level Sensor Signal circuit, at the Fuel Level Sensor, should be between approximately 1.0 volt (Fuel Tank FULL) and 10.5 volts (Fuel Tank EMPTY). The voltage is used up through the resistor within the Fuel Level Sensor, therefore the voltage on the Fuel Level Sense Return circuit should be zero volts.

The voltage reading in the scan tool is scaled to read between approximately 0.6 volts (Fuel Tank FULL) and 4.5 volts (Fuel Tank EMPTY).

NOTE: Voltage measuring approximately 12.0 volts (source voltage) on the Fuel Level Sensor Signal circuit, at the BCM and Fuel Level Sensor harness connectors (with the harness connectors plugged in), may indicate a short to voltage on the Fuel Level Sensor Signal circuit or an open on the Fuel Level Sense Return circuit.

NOTE: Voltage measuring approximately 12.0 volts (source voltage) on the Fuel Level Sensor Signal circuit, at the BCM harness connector, but 0.0 volts at the Fuel Level Sensor harness connector (with the harness connectors plugged in), may indicate an open on the Fuel Level Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects less than 31.0 Ohms on the Fuel Level Sensor Signal circuit for greater than 12 seconds.

DEFAULT ACTION

- Fuel Gauge displays empty.

POSSIBLE CAUSES

Possible Causes
FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO THE FUEL LEVEL SENSE RETURN CIRCUIT
FUEL LEVEL SENSOR
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. CHECK THE PRIMARY FUEL LEVEL SENSOR FOR AN INTERNAL SHORT

1. Turn the ignition off.
2. Disconnect the Fuel Pump Module harness connector.
3. Turn the ignition on.
4. With the scan tool, read BCM and PCM DTCs.

Is BCM DTC: P0460-15-FUEL LEVEL SENSOR 1 - CIRCUIT SHORT TO BATTERY OR OPEN or PCM DTC: P0463-00-FUEL LEVEL SENSOR 1 CIRCUIT HIGH active or pending?

Yes

- Check the Fuel Pump Module harness for any signs of damage which could cause an open or shorted circuit. If no problem is found, replace the Fuel Level Sensor in accordance with the Service Information. Refer to **ASSEMBLY, FUEL PUMP, REMOVAL AND INSTALLATION**.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (N4) FUEL LEVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE (N4) FUEL LEVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE (G109) FUEL LEVEL SENSE RETURN CIRCUIT

1. The ignition must be off when checking a circuit for continuity.
2. Connect the negative lead of the DVOM to one of the circuits being tested at the ECU or component harness connector.
3. Connect the positive lead of the DVOM to the other circuit being tested at the ECU or component harness connector and check for continuity between the circuits.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits being tested?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
 - Test complete.
-

2021 ACCESSORIES AND BODY, CAB

Body Control Module (BCM) - DTCS P0460-15 To U1516-87 - Gladiator

DTC TROUBLESHOOTING

P0460-15-FUEL LEVEL SENSOR 1 - CIRCUIT SHORT TO BATTERY OR OPEN

For a complete FUEL DELIVERY SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Body Control Module (BCM) helps determine the amount of fuel remaining in the Fuel Tank by monitoring the Fuel Level Sensor and sending CAN Bus fuel level messages to the modules that require fuel level information. The BCM monitors the Fuel Level Sensor through hardwired Fuel Level Sensor Signal and Fuel Level Sense Return circuits. The Fuel Level Sensor includes a Fuel Level Sensor Arm and Float, along with an integral variable resistor, which operates between 51.0 Ohms and 992.0 Ohms. The resistance value of the Fuel Level Sensor varies, depending on the amount of fuel remaining in the Fuel Tank. When the Fuel Level Sensor Arm and Float is at the highest point of travel (Fuel Tank FULL), the resistance is approximately 51.0 Ohms. When the Fuel Level Sensor Arm and Float is at the lowest point of travel (Fuel Tank EMPTY), the resistance is approximately 992.0 Ohms.

On a normally functioning system, with no circuit faults and the harness connectors plugged in, the voltage on the Fuel Level Sensor Signal circuit, at the Fuel Level Sensor, should be between approximately 1.0 volt (Fuel Tank FULL) and 10.5 volts (Fuel Tank EMPTY). The voltage is used up through the resistor within the Fuel Level Sensor, therefore the voltage on the Fuel Level Sense Return circuit should be zero volts.

The voltage reading in the scan tool is scaled to read between approximately 0.6 volts (Fuel Tank FULL) and 4.5 volts (Fuel Tank EMPTY).

NOTE: Voltage measuring approximately 12.0 volts (source voltage) on the Fuel Level Sensor Signal circuit, at the BCM and Fuel Level Sensor harness connectors (with the harness connectors plugged in), may indicate a short to voltage on the Fuel Level Sensor Signal circuit or an open on the Fuel Level Sense Return circuit.

NOTE: Voltage measuring approximately 12.0 volts (source voltage) on the Fuel Level Sensor Signal circuit, at the BCM harness connector, but 0.0 volts at the Fuel Level Sensor harness connector (with the harness connectors plugged in), may indicate an open on the Fuel Level Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects greater than 1,337 Ohms on the Fuel Level Sensor Signal circuit for greater than 12 seconds.

DEFAULT ACTION

- Fuel Gauge displays empty.

POSSIBLE CAUSES

Possible Causes
FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
FUEL LEVEL SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
FUEL LEVEL SENSE RETURN CIRCUIT OPEN/HIGH RESISTANCE
FUEL LEVEL SENSOR
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Go To [2](#)

2. MONITOR THE FUEL LEVEL SENSOR VOLTAGE READING FOR AN OPEN SPOT ON THE SENSOR

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in possible serious or fatal injury.

1. Disconnect the fuel supply line at the fuel rail.
2. Connect a drain hose between the fuel supply line and an approved fuel container.
3. Turn the ignition on.
4. Remove the Fuel Pump Relay from the Power Distribution Center (PDC) Assembly.

NOTE: When the Fuel Tank is completely empty, the Fuel Level Sensor should read at or near empty (indicated by a voltage reading of approximately 4.3-4.5 volts) on the scan tool. If the Fuel Tank is near full, the scan tool should read approximately 0.6 volts on the scan tool.

5. Connect a jumper across Fuel Pump Relay terminal 30 and terminal 87 to actuate the Fuel Pump Assembly until all fuel is removed from the Fuel Tank.
6. Remove the jumper when there is no more fuel coming out of the hose.

NOTE: Make sure that you have enough fuel to put back into the vehicle to make a good determination of the Fuel Level Sensor voltage feedback. It may be necessary to add more fuel to what was removed in order to do so.

NOTE: The Fuel Level Sensor voltage should decrease as fuel is added at a steady rate. Watch for the voltage to change suddenly while fuel is being added. If the voltage suddenly changes to or near 5.0 volts, it would indicate a bad spot (open) on that portion of the sensor.

7. While monitoring the Fuel Level Sensor voltage reading on scan tool, begin putting fuel back into the Fuel Tank.

Did the Fuel Level Sensor reading suddenly change to 5.0 volts at any time while adding fuel?

Yes

- Replace the Fuel Level Sensor in accordance with the Service Information. .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

3. CHECK THE FUEL LEVEL SENSOR (N4) POSITION SIGNAL 1 CIRCUIT VOLTAGE

NOTE: The Fuel Pump Assembly harness connector must be connected when performing this step. The sensor is powered by a voltage close to the vehicle Battery (minus a diode voltage drop). If disconnected, the voltage reading on the Fuel Level Sensor Signal circuit will be equal to source voltage which is approximately Battery voltage.

1. Back probe and measure the voltage on the Fuel Level Sensor (N4) Position Signal 1 circuit at the Fuel Pump Assembly harness connector.

What is the voltage reading?

Source voltage (approximately 12.0 volts):

- Go To [5](#)

Zero volts:

- Go To [4](#)

4. DISCONNECT THE FUEL PUMP MODULE AND BCM HARNESS CONNECTORS - CHECK THE (N4) FUEL LEVEL SENSOR SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE VOLTAGE AT THE (G109) RETURN CIRCUIT

NOTE: The Fuel Pump Assembly harness connector must be connected when performing this step.

1. Back probe and measure the voltage on the (G109) Return circuit at the Fuel Pump Assembly harness connector.

What is the voltage reading?

Source voltage (approximately 12.0 volts):

- Go To [7](#)

Zero volts:

- Go To [6](#)

6. DISCONNECT THE FUEL PUMP MODULE AND BCM HARNESS CONNECTORS - CHECK THE FUEL LEVEL SENSOR (N4) POSITION SIGNAL 1 CIRCUIT FOR A SHORT TO ANOTHER VOLTAGE SUPPLY CIRCUIT

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to the circuit being tested.
4. Connect the positive lead of the DVOM to all other circuits at the ECU harness connector and check for continuity between the circuits.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between the circuits.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit being tested for a short to the circuit that showed continuity.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Fuel Level Sensor in accordance with the Service Information. .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. DISCONNECT THE FUEL PUMP MODULE AND BCM HARNESS CONNECTORS - CHECK THE (G109) FUEL LEVEL SENSE RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [8](#)

8. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P1276-12-STARTER CONTROL 2-CIRCUIT SHORT TO BATTERY

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Starter is activated and the Body Control Module (BCM) detects a short to voltage on the Stop/Start Relay Control circuit.
- After four consecutive failed retry attempts the BCM will disable the output for the remainder of the ignition cycle.

DEFAULT ACTION

- The Starter is inoperative.

POSSIBLE CAUSES

Possible Causes
STOP/START RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
STOP/START RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

NOTE: **CLEARING THE DTC AFTER MAKING A REPAIR - Perform after wiring repair or module replacement:**

Before the DTC can be erased from the Body Control Module (BCM), the BCM must detect an ignition ON/OFF/ON cycle, making sure the Power Accessory Delay (PAD) is deactivated after the ignition transitions to OFF, along with the normal operation of the system associated with this DTC.

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, read Body Control Module (BCM) DTCs.

Is the DTC Active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. SUBSTITUTE THE STOP/START RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: **When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.**

NOTE: **Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.**

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. CHECK FOR VOLTAGE ON THE (K88) STOP/START RELAY CONTROL CIRCUIT AT THE STOP/START RELAY TERMINAL

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the relay terminal in the PDC Assembly.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [4](#)

No

- Go To [7](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K88) STOP/START RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K88) STOP/START RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the PDC Assembly harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [7](#)

6. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to [**CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P1276-14-STARTER CONTROL 2-CIRCUIT SHORT TO GROUND OR OPEN

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Starter is not activated and the Body Control Module (BCM) detects less than 1.5 volts on the Stop/Start Relay Control circuit for greater than 1.28 seconds.

DEFAULT ACTION

- The Starter will be inoperative.

POSSIBLE CAUSES

Possible Causes
STOP/START RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
STOP/START RELAY CONTROL CIRCUIT SHORTED TO GROUND
STOP/START RELAY
POWER DISTRIBUTION CENTER (PDC) ASSEMBLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. SUBSTITUTE THE STOP/START RELAY - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE:

When removing relays from the PDC Assembly, do not rock or wiggle the relay sideways during removal. Lift the relay upward, using fingers or suitable pliers, at the middle of the relay body and inspect the relay terminals for proper contact.

NOTE: Additional DTCs may set in other Electronic Control Units (ECUs) when substituting relays in the PDC Assembly.

1. Turn the ignition off.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Substitute the relay with a similar known good relay in the PDC Assembly.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the relay that caused the fault. With the scan tool, erase any additional DTCs that may have set when the relays were substituted.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (K88) STOP/START RELAY CONTROL CIRCUIT FOR CONTINUITY TO GROUND AT THE STOP/START RELAY TERMINAL

1. The ignition must be off when checking a circuit for continuity to ground.
2. Remove the relay, for the circuit being tested, from the Power Distribution Center (PDC) Assembly.
3. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. Connect the positive lead of the DVOM to the circuit being tested, at the relay terminal in the Power Distribution Center (PDC) Assembly, and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. DISCONNECT THE POWER DISTRIBUTION CENTER (PDC) ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K88) STOP/START RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Disconnect all Power Distribution Center (PDC) Assembly harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the PDC Assembly harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [7](#)

5. CHECK THE (K88) STOP/START RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the relay terminal in the Power Distribution Center (PDC) Assembly.
4. Connect the other lead to the circuit being tested at the Electronic Control Unit (ECU) harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Go To [6](#)

No

- Go To [8](#)

6. DISCONNECT THE PDC ASSEMBLY HARNESS CONNECTOR(S) AND CHECK THE (K88) STOP/START RELAY CONTROL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.

2. Disconnect the Power Distribution Center (PDC) Assembly harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the PDC Assembly harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [7](#)

7. DISCONNECT RELATED PDC ASSEMBLY HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PDC Assembly harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PDC Assembly harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Power Distribution Center (PDC) Assembly in accordance with the Service Information. Refer to **CENTER, POWER DISTRIBUTION (PDC), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

8. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

-
- Test complete.

U0002-00-CAN C BUS OFF PERFORMANCE

For a complete CAN C BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Below are a few different ways communication on a vehicle takes place:

1. Scan tool to the Gateway Module
2. ECU to ECU
3. ECU to Device
4. Device to ECU

Communication to the vehicle is established with a scan tool, through the Data Link Connector (DLC) to a Gateway ECU over the Controller Area Network (CAN) Bus. On this vehicle the Security Gateway (SGW) Module communicates with the scan tool through the CAN-C and CAN-IHS Bus networks.

The CAN Bus architecture of this vehicle operates in a "hub" or "star" style, meaning all of the ECUs are connected at a central point in the Star Connectors. The terminating resistors for CAN Bus are located in the Star Connectors and are a part of the body and instrument panel wiring harnesses.

In other CAN Bus architectures a vehicle may operate in a "stub" or "backbone" style, meaning there is a single, main line that connects all ECUs. The terminating resistors for a CAN Bus in the "stub" or "backbone" style are located in 2 separate dominant ECUs and are placed as far apart in the vehicle, as is physically possible.

The header of the scan tool is populated by the BCM with vehicle data, when communication with the scan tool has been established through the SGW Module. The scan tool becomes another ECU on the vehicle's networks by acting as the primary controlling ECU of all Bus networks while connected to the DLC, and contributes voltage to the operation of the CAN Bus.

CAN BUS OPERATIONAL VOLTAGES

CAN C Bus Operational Voltages								
CAN C Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

CAN IHS Bus Operational Voltages							
CAN IHS Circuits	Key-Off (Bus Asleep)	Key-On (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0.0 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage	2.45 V

CAN IHS Bus Operational Voltages							
CAN IHS Circuits	Key-Off (Bus Asleep)	Key-On (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
						Less 0.75 V	
CAN (+)	0.0 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

Notes
All measurements were taken between a ECU ground and a CAN Bus terminal, using a standard DVOM. The DVOM will display the average network voltage.
Total resistance of the CAN Bus networks should be measured with the battery, and auxiliary battery (if equipped with Engine Stop/Start), disconnected. The normal average CAN Bus resistance is approximately 60 Ohms. The termination resistors are integral to the Star Connectors.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the ignition is in the Run position and a module on the CAN C Bus detects a short on a CAN C Bus circuit, the CAN C (+) and CAN C (-) Bus circuits are shorted together, or a faulty CAN C Bus module exists on the network for greater than one second.

DEFAULT ACTION

- Communication on the CAN C Bus is limited, erroneous or does not exist.

POSSIBLE CAUSES

Possible Causes
CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE OR GROUND
CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE OR GROUND
CAN C BUS (+) CIRCUIT SHORTED TO THE CAN C BUS (-) CIRCUIT
POOR HARNESS CONNECTOR CONNECTION(S)
STAR CONNECTOR
CAN C BUS RELATED MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: Due to a loss of communication on the CAN Bus, multiple modules may not communicate on the network. If the scan tool does not communicate with the Body Control Module (BCM), Go To **2**.

1. Turn the ignition on.
2. With the scan tool, read the Body Control Module (BCM) DTCs and record on the repair order.
3. With the scan tool, erase the BCM DTCs.

4. Turn the ignition off and wait 10 seconds.
5. Turn the ignition on.
6. With the scan tool, read the BCM DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. MEASURE THE VOLTAGE ON THE CAN C BUS (+) AND (-) CIRCUITS

NOTE: Disconnecting the Radio Frequency (RF) Hub Module or Body Control Module (BCM) may result in a loss of ignition status messages and may cause scan tool communication concerns.

NOTE: The scan tool Network Review display (network topology) depicts a high level view of the vehicle network and can assist in identifying vehicle communication problems. Modules reporting a loss of communication usually appear in red. Using this display can help determine the location of the fault.

1. Using the wiring diagrams as a guide, locate and access the CAN C IP/Front Star Connector.
2. Make sure the ignition is on.
3. Record the voltage measurements, for use in later steps.
4. Using the appropriate back-probe tools, measure the voltage on the CAN C Bus (+) circuit, at the Security Gateway (SGW) Module side of the CAN C IP/Front Star Connector.
5. Using the appropriate back-probe tools, measure the voltage on the CAN C Bus (-) circuit, at the SGW Module side of the CAN C IP/Front Star Connector.
6. Compare the voltage measurements to the specified CAN C Bus voltages in the above CAN BUS VOLTAGE TABLE.

Are the voltages on the CAN C Bus (+) and (-) circuits **WITHIN** the specified values?

Yes

- Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

No

- Go To [3](#)

3. CHECK THE CAN C BUS (+) AND (-) CIRCUITS FOR A SHORT TO VOLTAGE

1. Refer to the recorded CAN C Bus voltage measurements and to the CAN BUS VOLTAGE TABLE.

Is the voltage on the CAN C Bus (+) or (-) circuit **ABOVE** the specified values?

Yes

- Inspect for a short to voltage on the CAN C Bus (+) or (-) circuit. Disconnect the 3-wire connector from the CAN C IP/Front Star Connector, isolating the CAN C Bus from the CAN

C Dash/Rear Star Connector, and measure the voltage on the CAN C Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Proceed, as needed:

- **CAN C Bus Voltages Are WITHIN Specified Values:** Reconnect the 3-wire connector into the CAN C IP/Front Star Connector and access the CAN C Dash/Rear Star Connector. One at a time, disconnect each connector from the CAN C Dash/Rear Star Connector. After disconnecting a connector, measure and record the voltage on the CAN C Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN C Dash/Rear Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- **CAN C Bus Voltages Are ABOVE Specified Values:** One at a time, disconnect each connector from the CAN C IP/Front Star Connector. After disconnecting a connector, measure and record the voltage on the CAN C Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN C IP/Front Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. CHECK THE CAN C BUS (+) AND (-) CIRCUITS FOR A SHORT TO GROUND

1. Refer to the recorded CAN C Bus voltage measurements and to the CAN BUS VOLTAGE TABLE.

Is the voltage on the CAN C Bus (+) or (-) circuit **BELOW** the specified values?

Yes

- Inspect for a short to ground on the CAN C Bus (+) or (-) circuit. Disconnect the 3-wire connector from the CAN C IP/Front Star Connector, isolating the CAN C Bus from the CAN C Dash/Rear Star Connector, and measure the voltage on the CAN C Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Proceed, as needed:
 - **CAN C Bus Voltages Are WITHIN Specified Values:** Reconnect the 3-wire connector into the CAN C IP/Front Star Connector and access the CAN C Dash/Rear Star Connector. One at a time, disconnect each connector from the CAN C Dash/Rear Star Connector. After disconnecting a connector, measure and record the voltage on the CAN C Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN C Dash/Rear Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
 - **CAN C Bus Voltages Are BELOW Specified Values:** One at a time, disconnect each connector from the CAN C IP/Front Star Connector. After disconnecting a connector, measure and record the voltage on the CAN C Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN C IP/Front Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE CAN C BUS TERMINATION RESISTANCE

1. Turn the ignition off.
2. Disconnect and isolate the battery negative cable.

3. If equipped, disconnect and isolate the auxiliary battery negative cable.
4. Using the appropriate back-probe tools, measure the resistance between the CAN C Bus (+) circuit and the CAN C Bus (-) circuit, at the SGW Module side of the CAN C IP/Front Star Connector.

Is the resistance **BETWEEN** 54.0 and 66.0 Ohms?

Yes

- **If Directed To This Test From Another Module:** Replace the module that directed to this diagnostic procedure, in accordance with the Service Information.
 - Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for the module, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- **If The BCM Set DTC: U0002-00:** Go To [6](#)

No

- **Resistance Is ABOVE 66.0 Ohms:** The internal terminating resistor in one of the Star Connectors is damaged. Inspect and repair, as necessary.
- **Resistance Is BELOW 54.0 Ohms:** Inspect for a short between the CAN C Bus (+) circuit and the CAN C Bus (-) circuit. Disconnecting Star Connectors and modules on the CAN C Bus can help determine the location of the short. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0010-00-CAN INTERIOR BUS

For a complete CAN IHS BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Below are a few different ways communication on a vehicle takes place:

1. Scan tool to the Gateway Module
2. ECU to ECU
3. ECU to Device
4. Device to ECU

Communication to the vehicle is established with a scan tool, through the Data Link Connector (DLC) to a Gateway ECU over the Controller Area Network (CAN) Bus. On this vehicle the Security Gateway (SGW) Module communicates with the scan tool through the CAN-C and CAN-IHS Bus networks.

The CAN Bus architecture of this vehicle operates in a "hub" or "star" style, meaning all of the ECUs are connected at a central point in the Star Connectors. The terminating resistors for CAN Bus are located in the Star Connectors and are a part of the body and instrument panel wiring harnesses.

In other CAN Bus architectures a vehicle may operate in a "stub" or "backbone" style, meaning there is a single, main line that connects all ECUs. The terminating resistors for a CAN Bus in the "stub" or "backbone" style are located in 2 separate dominant ECUs and are placed as far apart in the vehicle, as is physically possible.

The header of the scan tool is populated by the BCM with vehicle data, when communication with the scan tool has been established through the SGW Module. The scan tool becomes another ECU on the vehicle's networks by acting as the primary controlling ECU of all Bus networks while connected to the DLC, and contributes voltage to the operation of the CAN Bus.

CAN BUS OPERATIONAL VOLTAGES

CAN C Bus Operational Voltages								
CAN C Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V

CAN C Bus Operational Voltages								
CAN C Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

CAN IHS Bus Operational Voltages							
CAN IHS Circuits	Key-Off (Bus Asleep)	Key-On (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0.0 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0.0 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

Notes

All measurements were taken between a ECU ground and a CAN Bus terminal, using a standard DVOM. The DVOM will display the average network voltage.

Total resistance of the CAN Bus networks should be measured with the battery, and auxiliary battery (if equipped with Engine Stop/Start), disconnected. The normal average CAN Bus resistance is approximately 60 Ohms. The termination resistors are integral to the Star Connectors.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the ignition is in the Run position and a module on the CAN IHS Bus detects a short on a CAN IHS Bus circuit, the CAN IHS (+) and CAN IHS (-) Bus circuits are shorted together, or a faulty CAN IHS Bus module exists on the network for greater than five seconds.

DEFAULT ACTION

- Communication on the CAN IHS Bus is limited, erroneous or does not exist.

POSSIBLE CAUSES

Possible Causes
CAN IHS BUS (+) CIRCUIT SHORTED TO VOLTAGE OR GROUND
CAN IHS BUS (-) CIRCUIT SHORTED TO VOLTAGE OR GROUND
CAN IHS BUS (+) CIRCUIT SHORTED TO THE CAN IHS BUS (-) CIRCUIT
POOR HARNESS CONNECTOR CONNECTION(S)
STAR CONNECTOR
CAN IHS BUS RELATED MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: Due to a loss of communication on the CAN Bus, multiple modules may not communicate on the network. If the scan tool does not communicate with the Body Control Module (BCM), Go To [2](#).

1. Turn the ignition on.
2. With the scan tool, read the Body Control Module (BCM) DTCs and record on the repair order.
3. With the scan tool, erase the BCM DTCs.
4. Turn the ignition off and wait 10 seconds.
5. Turn the ignition on.
6. With the scan tool, read the BCM DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. MEASURE THE VOLTAGE ON THE CAN IHS BUS (+) AND (-) CIRCUITS

NOTE: The scan tool Network Review display (network topology) depicts a high level view of the vehicle network and can assist in identifying vehicle communication problems. Modules reporting a loss of communication usually appear in red. Using this display can help determine the location of the fault.

1. Using the wiring diagrams as a guide, locate and access the CAN IHS IP/Front Star Connector.
2. Make sure the ignition is on.
3. Record the voltage measurements, for use in later steps.
4. Using the appropriate back-probe tools, measure the voltage on the CAN IHS Bus (+) circuit, at the Security Gateway (SGW) Module side of the CAN IHS IP/Front Star Connector.
5. Using the appropriate back-probe tools, measure the voltage on the CAN IHS Bus (-) circuit, at the SGW Module side of the CAN IHS IP/Front Star Connector.
6. Compare the voltage measurements to the specified CAN IHS Bus voltages in the above CAN BUS VOLTAGE TABLE.

Are the voltages on the CAN IHS Bus (+) and (-) circuits **WITHIN** the specified values?

Yes

- Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

No

- Go To [3](#)

3. CHECK THE CAN IHS BUS (+) AND (-) CIRCUITS FOR A SHORT TO VOLTAGE

1. Refer to the recorded CAN IHS Bus voltage measurements and to the CAN BUS VOLTAGE TABLE.

Is the voltage on the CAN IHS Bus (+) or (-) circuit **ABOVE** the specified values?

Yes

- Inspect for a short to voltage on the CAN IHS Bus (+) or (-) circuit. Disconnect the 3-wire connector from the CAN IHS IP/Front Star Connector, isolating the CAN IHS Bus from the CAN IHS Body/Rear Star Connector, and measure the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Proceed, as needed:
 - **CAN IHS Bus Voltages Are WITHIN Specified Values:** Reconnect the 3-wire connector into the CAN IHS IP/Front Star Connector and access the CAN IHS Body/Rear Star Connector. One at a time, disconnect each connector from the CAN IHS Body/Rear Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS Body/Rear Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
 - **CAN IHS Bus Voltages Are ABOVE Specified Values:** One at a time, disconnect each connector from the CAN IHS IP/Front Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS IP/Front Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. CHECK THE CAN IHS BUS (+) AND (-) CIRCUITS FOR A SHORT TO GROUND

1. Refer to the recorded CAN IHS Bus voltage measurements and to the CAN BUS VOLTAGE TABLE.

Is the voltage on the CAN IHS Bus (+) or (-) circuit **BELOW** the specified values?

Yes

- Inspect for a short to ground on the CAN IHS Bus (+) or (-) circuit. Disconnect the 3-wire connector from the CAN IHS IP/Front Star Connector, isolating the CAN IHS Bus from the CAN IHS Body/Rear Star Connector, and measure the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Proceed, as needed:
 - **CAN IHS Bus Voltages Are WITHIN Specified Values:** Reconnect the 3-wire connector into the CAN IHS IP/Front Star Connector and access the CAN IHS Body/Rear Star Connector. One at a time, disconnect each connector from the CAN IHS Body/Rear Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS Body/Rear Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
 - **CAN IHS Bus Voltages Are BELOW Specified Values:** One at a time, disconnect each connector from the CAN IHS IP/Front Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS IP/Front Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **5**

5. CHECK THE CAN IHS BUS TERMINATION RESISTANCE

1. Turn the ignition off.
2. Disconnect and isolate the battery negative cable.
3. If equipped, disconnect and isolate the auxiliary battery negative cable.
4. Using the appropriate back-probe tools, measure the resistance between the CAN IHS Bus (+) circuit and the CAN IHS Bus (-) circuit, at the SGW Module side of the CAN IHS IP/Front Star Connector.

Is the resistance **BETWEEN** 54.0 and 66.0 Ohms?

Yes

- **If Directed To This Test From Another Module:** Replace the module that directed to this diagnostic procedure, in accordance with the Service Information.
 - Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for the module, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- **If The BCM Set DTC: U0010-00:** Go To **6**

No

- **Resistance Is ABOVE 66.0 Ohms:** The internal terminating resistor in one of the Star Connectors is damaged. Inspect and repair, as necessary.
- **Resistance Is BELOW 54.0 Ohms:** Inspect for a short between the CAN IHS Bus (+) circuit and the CAN IHS Bus (-) circuit. Disconnecting Star Connectors and modules on the CAN IHS Bus can help determine the location of the short. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

For a complete CAN IHS BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Below are a few different ways communication on a vehicle takes place:

1. Scan tool to the Gateway Module
2. ECU to ECU
3. ECU to Device
4. Device to ECU

Communication to the vehicle is established with a scan tool, through the Data Link Connector (DLC) to a Gateway ECU over the Controller Area Network (CAN) Bus. On this vehicle the Security Gateway (SGW) Module communicates with the scan tool through the CAN-C and CAN-IHS Bus networks.

The CAN Bus architecture of this vehicle operates in a "hub" or "star" style, meaning all of the ECUs are connected at a central point in the Star Connectors. The terminating resistors for CAN Bus are located in the Star Connectors and are a part of the body and instrument panel wiring harnesses.

In other CAN Bus architectures a vehicle may operate in a "stub" or "backbone" style, meaning there is a single, main line that connects all ECUs. The terminating resistors for a CAN Bus in the "stub" or "backbone" style are located in 2 separate dominant ECUs and are placed as far apart in the vehicle, as is physically possible.

The header of the scan tool is populated by the BCM with vehicle data, when communication with the scan tool has been established through the SGW Module. The scan tool becomes another ECU on the vehicle's networks by acting as the primary controlling ECU of all Bus networks while connected to the DLC, and contributes voltage to the operation of the CAN Bus.

CAN BUS OPERATIONAL VOLTAGES

CAN C Bus Operational Voltages								
CAN C Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

CAN IHS Bus Operational Voltages							
CAN IHS Circuits	Key-Off (Bus Asleep)	Key-On (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0.0 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0.0 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

Notes

All measurements were taken between a ECU ground and a CAN Bus terminal, using a standard DVOM. The DVOM will display the average network voltage.

Total resistance of the CAN Bus networks should be measured with the battery, and auxiliary battery (if equipped with Engine Stop/Start), disconnected. The normal average CAN Bus resistance is approximately 60 Ohms. The termination resistors are integral to the Star Connectors.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the ignition is in the Run position and a module on the CAN IHS Bus detects a short on a CAN IHS Bus circuit, the CAN IHS (+) and CAN IHS (-) Bus circuits are shorted together, or a faulty CAN IHS Bus module exists on the network for greater than one second.

DEFAULT ACTION

- Communication on the CAN IHS Bus is limited, erroneous or does not exist.

POSSIBLE CAUSES

Possible Causes
CAN IHS BUS (+) CIRCUIT SHORTED TO VOLTAGE OR GROUND
CAN IHS BUS (-) CIRCUIT SHORTED TO VOLTAGE OR GROUND
CAN IHS BUS (+) CIRCUIT SHORTED TO THE CAN IHS BUS (-) CIRCUIT
POOR HARNESS CONNECTOR CONNECTION(S)
STAR CONNECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: Due to a loss of communication on the CAN Bus, multiple modules may not communicate on the network. If the scan tool does not communicate with the Body Control Module (BCM), Go To **2**.

1. Turn the ignition on.
2. With the scan tool, read the Body Control Module (BCM) DTCs and record on the repair order.
3. With the scan tool, erase the BCM DTCs.
4. Turn the ignition off and wait 10 seconds.
5. Turn the ignition on.
6. With the scan tool, read the BCM DTCs.

Did the DTC return?

Yes

- Go To **2**

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. MEASURE THE VOLTAGE ON THE CAN IHS BUS (+) AND (-) CIRCUITS

NOTE: The scan tool Network Review display (network topology) depicts a high level view of the vehicle network and can assist in identifying vehicle communication problems. Modules reporting a loss of communication usually appear in red. Using this display can help determine the location of the fault.

1. Using the wiring diagrams as a guide, locate and access the CAN IHS IP/Front Star Connector.
2. Make sure the ignition is on.
3. Record the voltage measurements, for use in later steps.
4. Using the appropriate back-probe tools, measure the voltage on the CAN IHS Bus (+) circuit, at the Security Gateway (SGW) Module side of the CAN IHS IP/Front Star Connector.
5. Using the appropriate back-probe tools, measure the voltage on the CAN IHS Bus (-) circuit, at the SGW Module side of the CAN IHS IP/Front Star Connector.
6. Compare the voltage measurements to the specified CAN IHS Bus voltages in the above CAN BUS VOLTAGE TABLE.

Are the voltages on the CAN IHS Bus (+) and (-) circuits **WITHIN** the specified values?

Yes

- Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE**.

No

- Go To [3](#)

3. CHECK THE CAN IHS BUS (+) AND (-) CIRCUITS FOR A SHORT TO VOLTAGE

1. Refer to the recorded CAN IHS Bus voltage measurements and to the CAN BUS VOLTAGE TABLE.

Is the voltage on the CAN IHS Bus (+) or (-) circuit **ABOVE** the specified values?

Yes

- Inspect for a short to voltage on the CAN IHS Bus (+) or (-) circuit. Disconnect the 3-wire connector from the CAN IHS IP/Front Star Connector, isolating the CAN IHS Bus from the CAN IHS Body/Rear Star Connector, and measure the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Proceed, as needed:
 - **CAN IHS Bus Voltages Are WITHIN Specified Values:** Reconnect the 3-wire connector into the CAN IHS IP/Front Star Connector and access the CAN IHS Body/Rear Star Connector. One at a time, disconnect each connector from the CAN IHS Body/Rear Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS Body/Rear Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
 - **CAN IHS Bus Voltages Are ABOVE Specified Values:** One at a time, disconnect each connector from the CAN IHS IP/Front Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS IP/Front Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE CAN IHS BUS (+) AND (-) CIRCUITS FOR A SHORT TO GROUND

1. Refer to the recorded CAN IHS Bus voltage measurements and to the CAN BUS VOLTAGE TABLE.

Is the voltage on the CAN IHS Bus (+) or (-) circuit **BELOW** the specified values?

Yes

- Inspect for a short to ground on the CAN IHS Bus (+) or (-) circuit. Disconnect the 3-wire connector from the CAN IHS IP/Front Star Connector, isolating the CAN IHS Bus from the CAN IHS Body/Rear Star Connector, and measure the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Proceed, as needed:
 - **CAN IHS Bus Voltages Are WITHIN Specified Values:** Reconnect the 3-wire connector into the CAN IHS IP/Front Star Connector and access the CAN IHS Body/Rear Star Connector. One at a time, disconnect each connector from the CAN IHS Body/Rear Star Connector. After disconnecting a connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS Body/Rear Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
 - **CAN IHS Bus Voltages Are BELOW Specified Values:** One at a time, disconnect each connector from the CAN IHS IP/Front Star Connector. After disconnecting a

connector, measure and record the voltage on the CAN IHS Bus (+) and (-) circuits, at the SGW Module side of the Star Connector. Repeat until all CAN IHS IP/Front Star Connector connectors are disconnected. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE CAN IHS BUS TERMINATION RESISTANCE

1. Turn the ignition off.
2. Disconnect and isolate the battery negative cable.
3. If equipped, disconnect and isolate the auxiliary battery negative cable.
4. Using the appropriate back-probe tools, measure the resistance between the CAN IHS Bus (+) circuit and the CAN IHS Bus (-) circuit, at the SGW Module side of the CAN IHS IP/Front Star Connector.

Is the resistance **BETWEEN** 54.0 and 66.0 Ohms?

Yes

- **If Directed To This Test From Another Module:** Replace the module that directed to this diagnostic procedure, in accordance with the Service Information.
 - Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for the module, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- **If The BCM Set DTC: U0011-00:** Go To [6](#)

No

- **Resistance Is ABOVE 66.0 Ohms:** The internal terminating resistor in one of the Star Connectors is damaged. Inspect and repair, as necessary.
- **Resistance Is BELOW 54.0 Ohms:** Inspect for a short between the CAN IHS Bus (+) circuit and the CAN IHS Bus (-) circuit. Disconnecting Star Connectors and modules on the CAN IHS Bus can help determine the location of the short. Repair or replace the circuit, module or connector, that when disconnected, allows the bus voltages to return to normal.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: Perform this diagnostic procedure **ONLY** when the DTC status is "Active". If the DTC status is "Stored" **DO NOT** proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0155-00-LOST COMMUNICATION WITH CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0161-00-LOST COMMUNICATION WITH COMPASS MODULE

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

For a complete FUSES RELAY wiring diagram, **Refer to the appropriate wiring information .**

For a complete GROUNDS wiring diagram, **Refer to the appropriate wiring information .**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module (BCM) does not receive LIN Bus 2 messages from the Compass Module for greater than five seconds.

DEFAULT ACTION

- Functionality related to the compass will be inoperative.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN/ACC) CIRCUIT OPEN OR SHORTED TO GROUND
LIN BUS 2 CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
COMPASS MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**STANDARD PROCEDURE**](#).

2. DISCONNECT THE COMPASS MODULE HARNESS CONNECTOR AND CHECK THE (F982) FUSED IGNITION SWITCH (RUN/ACC) CIRCUIT BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

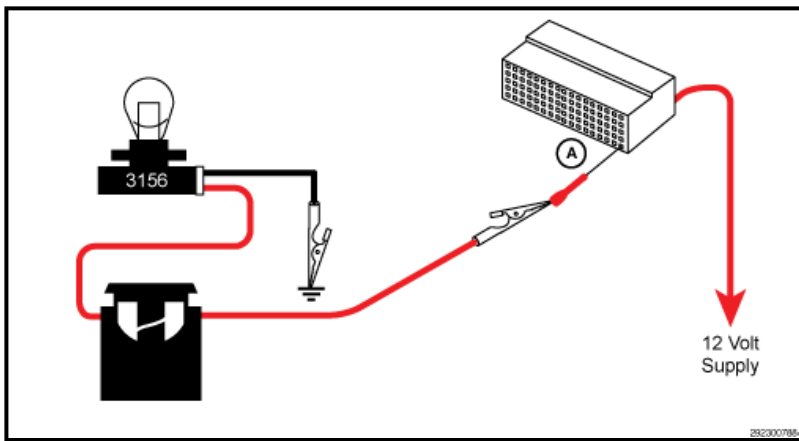
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#).**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE**](#).**



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the Fused B(+) circuit for an open, high resistance or short to ground. Use the wiring diagram as a guide to trace the circuit and look for any fuses, in-line connectors or splices to help isolate the location of the open, high resistance or short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE (Z912) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
2. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load

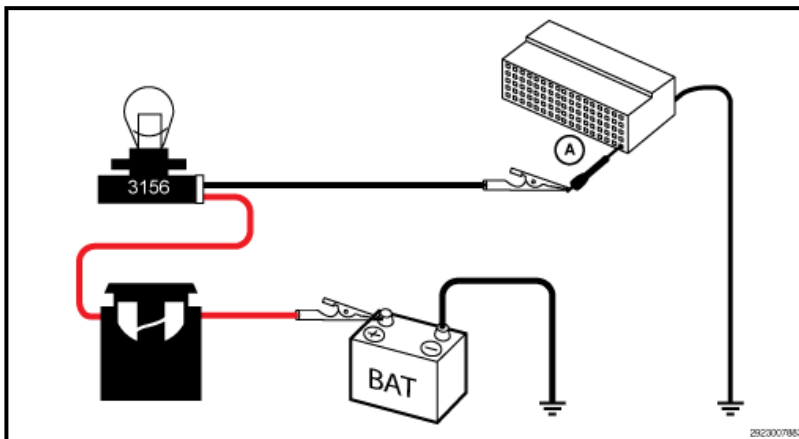
test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE:

When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE VOLTAGE ON THE (D402) LIN BUS 2 CIRCUIT AT THE COMPASS MODULE HARNESS CONNECTOR

1. Turn the ignition on.
2. Using a DVOM, measure the voltage on the circuit being tested at component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Replace the Compass Module in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D402) LIN BUS 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0164-00-LOST COMMUNICATION WITH HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0167-00-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0184-00-LOST COMMUNICATION WITH RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0206-00 LOST COMMUNICATION WITH POWER TOP CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0212-00-LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0213-00-LOST COMMUNICATION WITH INTERIOR MIRROR CONTROL MODULE "A"-

For a complete MIRRORS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive Local Interface Network (LIN) Bus messages from the Interior Rearview Mirror for greater than five seconds.

DEFAULT ACTION

- Functionality related to the Interior Rearview Mirror will not update.

POSSIBLE CAUSES

Possible Causes
OPEN FUSE
FUSED IGNITION CIRCUIT OPEN OR SHORTED TO GROUND
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
LIN BUS CIRCUIT OPEN OR HIGH RESISTANCE
INTERIOR REARVIEW MIRROR
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

NOTE: **Diagnose and repair any other LIN Bus related DTCs before proceeding with this diagnostic procedure.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE INTERIOR REARVIEW MIRROR HARNESS CONNECTOR AND CHECK THE (F982) FUSED IGNITION SWITCH (RUN/ACC) CIRCUIT BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).**

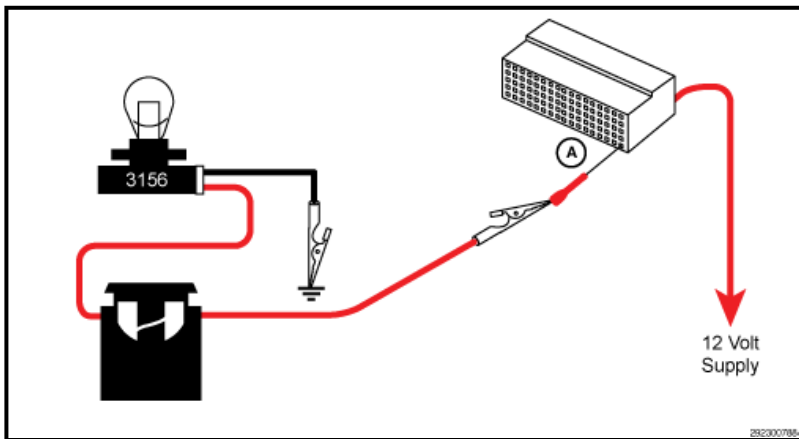
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.

- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Remove the Fuse for the Interior Rearview Mirror and inspect it for an open.
- **If Fuse Is Good:** Install the Fuse that was removed and repair the open or high resistance in the Fused Ignition circuit. Using the wiring diagrams as a guide inspect the circuit, related in-line connectors and splice connections for an open or high resistance.
- **If Fuse Is Open:** Repair the short to ground in the Fused Ignition circuit. Using the wiring diagrams as a guide inspect the circuit, related in-line connectors and splice connections for a short. Replace the Fuse that was removed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE (Z910) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. If not disconnected, disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.

4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

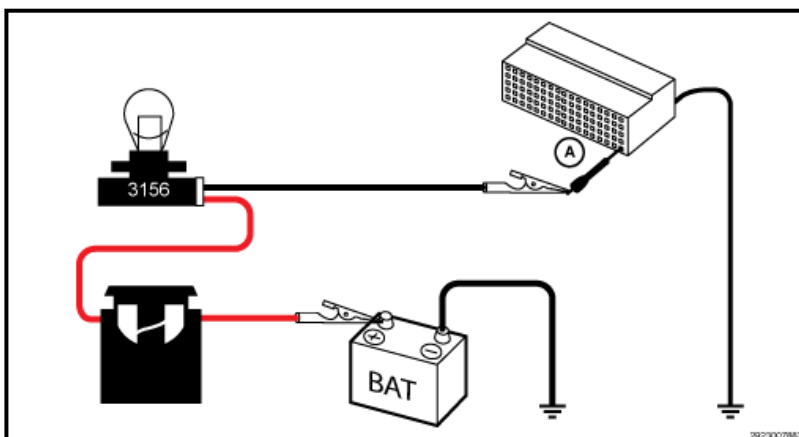
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness

connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance. Using the wiring diagrams as a guide, make sure to also inspect any related in-line connectors or splice connections.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D402) LIN BUS 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [5](#)

5. RECONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE VOLTAGE ON THE (D402) LIN BUS 2 CIRCUIT AT THE INTERIOR REARVIEW MIRROR

1. Connect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested.
2. Turn the ignition on.
3. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Replace the Interior Rearview Mirror in accordance with the Service Information. Refer to [MIRROR, REARVIEW, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module (BCM) detects the LIN Bus 1 circuit is shorted to ground or battery voltage for greater than three seconds.

DEFAULT ACTION

- No communication on LIN Bus 1 circuit,

POSSIBLE CAUSES

Possible Causes
LIN BUS 1 CIRCUIT SHORTED TO GROUND
LIN BUS 1 CIRCUIT SHORTED TO VOLTAGE
UPPER SWITCH BANK MODULE
UPPER SWITCH BANK 2 MODULE
INTELLIGENT BATTERY SENSOR (IBS)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE INTELLIGENT BATTERY SENSOR (IBS) HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Visually inspect the negative battery cable connection to the Intelligent Battery Sensor (IBS) for any damage or corrosion and repair as needed. If no problems are found, replace the Intelligent Battery Sensor (IBS) in accordance with the Service Information. Refer to [SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION](#) [SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE UPPER SWITCH BANK MODULE HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Upper Switch Bank Module in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE UPPER SWITCH BANK 2 MODULE HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Upper Switch Bank 2 Module in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D401) LIN BUS 1 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE (D401) LIN BUS 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Connect the negative lead of the DVOM to a known good ground.
3. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [7](#)

7. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U1009-00-LIN 2 BUS

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module (BCM) detects the LIN Bus 2 circuit is shorted to ground or battery voltage for greater than three seconds.

DEFAULT ACTION

- No communication on LIN Bus 2 circuit.

POSSIBLE CAUSES

Possible Causes
LIN BUS 2 CIRCUIT SHORTED TO GROUND
LIN BUS 2 CIRCUIT SHORTED TO VOLTAGE
INSIDE REAR VIEW MIRROR
COMPASS MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE INSIDE REAR VIEW MIRROR HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Interior Rearview Mirror in accordance with the Service Information. Refer to [MIRROR, REARVIEW, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE COMPASS MODULE HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Compass Module in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D402) LIN BUS 2 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE (D402) LIN BUS 2 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Connect the negative lead of the DVOM to a known good ground.
3. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U1045-00-LIN 3 BUS

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module (BCM) detects the LIN Bus 3 circuit is shorted to ground or battery voltage for greater than three seconds.

DEFAULT ACTION

- No communication on LIN Bus 3 circuit,

POSSIBLE CAUSES

Possible Causes
LIN BUS 3 CIRCUIT SHORTED TO GROUND
LIN BUS 3 CIRCUIT SHORTED TO VOLTAGE
STEERING COLUMN CONTROL MODULE (SCCM)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE STEERING COLUMN CONTROL MODULE (SCCM) HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D403) LIN BUS 3 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.

2. Disconnect all Electronic Control Unit (ECU) harness connectors for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE (D403) LIN BUS 3 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Connect the negative lead of the DVOM to a known good ground.
3. Connect the positive lead of the DVOM to the circuit being tested at the ECU or component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U112D-00-LOST COMMUNICATION WITH EVIC STEERING WHEEL SWITCHES

For a complete MESSAGE SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive Left Steering Wheel Switch LIN Bus messages from the Steering Column Control Module (SCCM) for greater than three seconds.

DEFAULT ACTION

- Functionality related to the Electronic Vehicle Information Center (EVIC) will not update.

POSSIBLE CAUSES

Possible Causes
ADDITIONAL LIN BUS DTCS SET
FUSED B(+) CIRCUIT OPEN
GROUND CIRCUIT OPEN
LIN BUS CIRCUIT OPEN
LEFT STEERING WHEEL SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read Body Control Module (BCM) DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- The condition or conditions that originally set this DTC are not present at this time. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals and correct pin tension. If no problems are found, test complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

2. CHECK IF THE STEERING COLUMN CONTROL MODULE (SCCM) COMMUNICATES ON THE NETWORK

1. Using the scan tool network topology screen, check the status of the Steering Column Control Module (SCCM).

Is the SCCM active on the scan tool network topology screen?

Yes

- Go To [3](#)

No

- Perform the NO RESPONSE FROM ECU procedure. Refer to **DIAGNOSIS AND TESTING** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK FOR ADDITIONAL DTCS

1. With the scan tool, read DTCs from all modules.

Are there other Steering Column Control Module (SCCM) or LIN Bus related DTCs Active?

Yes

- Repair the Steering Column Control Module (SCCM) or LIN Bus related DTCs before proceeding with this diagnostic procedure.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK FOR VOLTAGE ON THE (A92/A929) FUSED B(+) CIRCUIT

1. Turn the ignition off.
2. Disconnect the Left Steering Wheel Switch harness connector.
3. Turn the ignition on.
4. Measure the voltage on the (A92/A929) Fused B(+) circuit at Left Steering Wheel Switch harness connector - terminal 4.

Is the voltage above 9.0 volts?

Yes

- Go To [5](#)

No

- Go To [8](#)

5. CHECK THE (Z92/912) GROUND CIRCUIT FOR CONTINUITY TO GROUND

1. Turn the ignition off.
2. Check for continuity between ground and the (Z92/912) Ground circuit at Left Steering Wheel Switch harness connector - terminal 6.

Is there continuity between ground and the (Z92/912) Ground circuit?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. CHECK THE STEERING COLUMN CONTROL MODULE (SCCM) LIN BUS PASS-THROUGH

1. Disconnect the SCCM C3 harness connector.
2. Connect a fused jumper wire between ground and the (D403/D594) LIN Bus circuit at SCCM C3, component side - terminal 12.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs.

Is DTC: U1045-00-LIN 3 BUS set as Active?

Yes

- Go To [10](#)

No

- Go To [7](#)

7. CHECK THE BCM FOR PROPER OPERATION

1. Remove the fused jumper wire from the SCCM.
2. Turn the ignition off.
3. Disconnect the SCCM C2 harness connector.
4. Connect a fused jumper wire between ground and the (D403) LIN Bus 3 circuit at SCCM C2 harness connector - terminal 7.
5. Turn the ignition on.
6. With the scan tool, read BCM DTCs.

Is DTC: U1045-00-LIN 3 BUS set as Active?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [11](#)

8. CHECK THE (A92/A929) FUSED B(+) CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the SCCM C3 harness connector.
3. Measure the resistance of the(A92/A929) Fused B(+) circuit between Left Steering Wheel Switch harness connector - terminal 4 and SCCM C3 harness connector - terminal 7.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open in the (A92/A929) Fused B(+) circuit.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

9. CHECK THE (Z92/912) GROUND CIRCUIT FOR AN OPEN

1. Disconnect the SCCM C3 harness connector.
2. Measure the resistance of the (Z92/912) Ground circuit between Left Steering Wheel Switch harness connector - terminal 6 and SCCM C3 harness connector - terminal 11.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open in the (Z92/912) Ground circuit.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [**MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION**](#).
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

10. CHECK THE (D594) LIN BUS CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Measure the resistance of the (D594) LIN Bus circuit between SCCM C3 harness connector - terminal 12 and Left Steering Wheel Switch harness connector - terminal 7.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open in the (D594) LIN Bus circuit.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Replace the Left Steering Wheel Switch in accordance with the Service Information.

Refer to [**SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION**](#).

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

11. CHECK THE (D403) LIN BUS 3 CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the BCM C5/E harness connector.
3. Measure the resistance of the (D403) LIN Bus 3 circuit between SCCM C2 harness connector - terminal 7 and BCM C5/E harness connector - terminal 45.

Is the resistance above 3.0 Ohms?

Yes

- Repair the open in the (D403) LIN Bus 3 circuit.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Go To [12](#)

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U113B-00-LOST COMMUNICATION WITH SWITCH BANK MODULE

For a complete MESSAGE SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive Local Interface Network (LIN) Bus messages from the Upper Switch Bank for greater than five seconds.

DEFAULT ACTION

- Functionality related to the Upper Switch Bank will be inoperative.

POSSIBLE CAUSES

Possible Causes
OPEN FUSE
FUSED B(+) CIRCUIT OPEN OR SHORTED TO GROUND
LIN BUS CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN
UPPER SWITCH BANK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Diagnose and repair any other LIN Bus related DTCs before proceeding with this diagnostic procedure.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE UPPER SWITCH BANK MODULE HARNESS CONNECTOR AND CHECK THE (A232) FUSED B(+) CIRCUIT BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for**

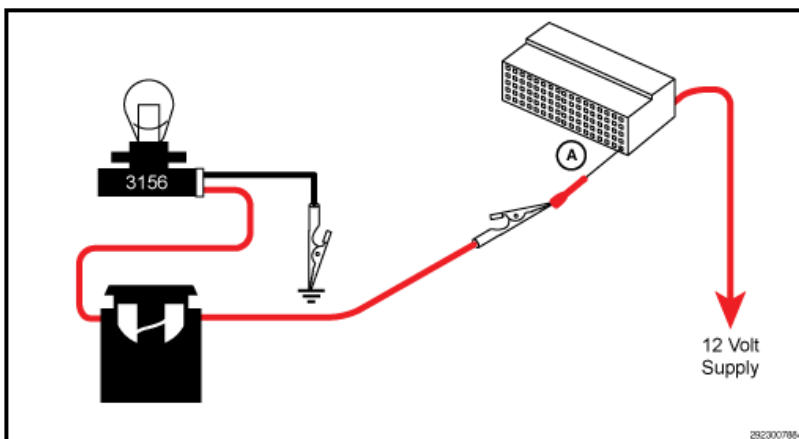
additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Remove the Fuse for the Upper Switch Bank Module and inspect it for an open.
- **If Fuse Is Good:** Install the Fuse that was removed and repair the open or high resistance in the Fused Ignition circuit. Using the wiring diagrams as a guide inspect the circuit, related in-line connectors and splice connections for an open or high resistance.
- **If Fuse Is Open:** Repair the short to ground in the Fused Ignition circuit. Using the wiring diagrams as a guide inspect the circuit, related in-line connectors and splice connections for a short. Replace the Fuse that was removed.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. CHECK THE (Z910) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
2. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .**

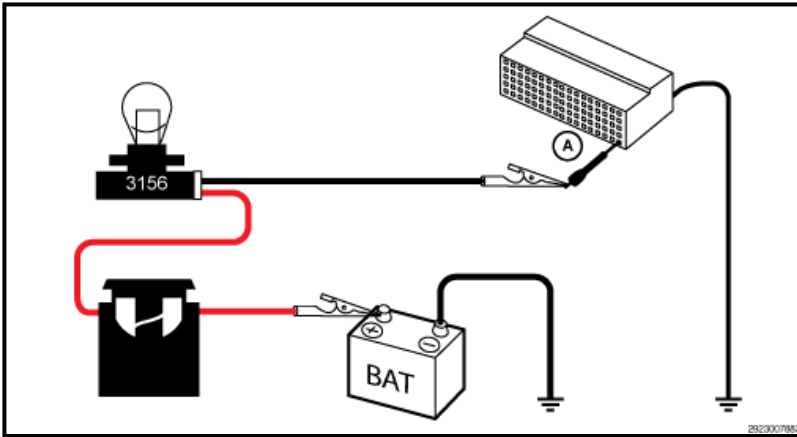
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load

testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance. Using the wiring diagrams as a guide, make sure to also inspect any related in-line connectors or splice connections.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D401) LIN BUS 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. RECONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE VOLTAGE ON THE (D401) LIN BUS 1 CIRCUIT AT THE UPPER SWITCH BANK MODULE

1. Connect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested.
2. Turn the ignition on.
3. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Replace the Upper Switch Bank Module in accordance with the Service Information. Refer to [POD, SWITCH, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U113E-00-LOST COMMUNICATION WITH INTELLIGENT BATTERY SENSOR

For a complete CHARGING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Intelligent Battery Sensor (IBS) is an electrical shunt with a microprocessor that is mounted in-line with the negative Battery Cable. The IBS monitors the current flow and voltage. The IBS also has a built in thermistor that calculates the Battery temperature. The microprocessor uses this data to calculate Battery state of charge, Battery internal resistance, charge received, charge delivered, and time in service. This information is reported through a LIN Bus circuit to the Body Control Module (BCM). The BCM broadcasts the information to the Powertrain Control Module (PCM) over the CAN Bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive Local Interface Network (LIN) Bus messages from the Intelligent Battery Sensor (IBS) for greater than five seconds.

DEFAULT ACTION

- Functionality related to the IBS will not update.

POSSIBLE CAUSES

Possible Causes
OPEN FUSE
FUSED B(+) CIRCUIT OPEN OR SHORTED TO GROUND
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
LIN BUS CIRCUIT OPEN OR HIGH RESISTANCE
INTELLIGENT BATTERY SENSOR (IBS)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Diagnose and repair any other LIN Bus related DTCs before proceeding with this diagnostic procedure.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE INTELLIGENT BATTERY SENSOR (IBS) HARNESS CONNECTOR AND CHECK THE (A916) FUSED B(+) CIRCUIT BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1**

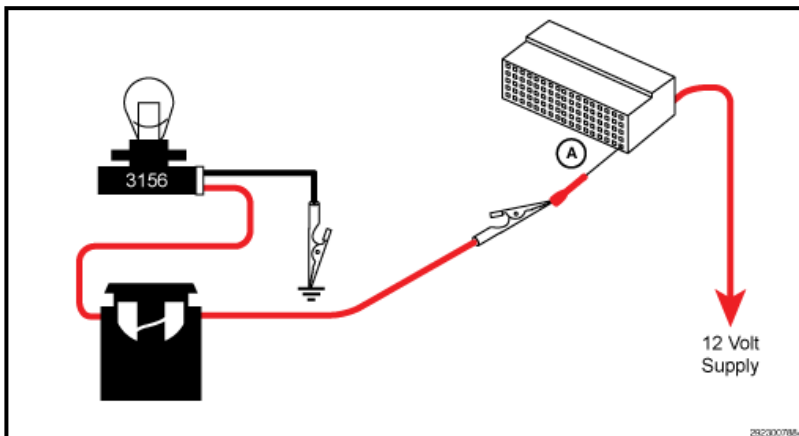
amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .



NOTE:

When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To

No

- Inspect the fuse for the Fused B(+) circuit being tested and perform the appropriate condition:
- **If Fuse is Open:** Repair the Fused B(+) circuit for a short to ground.

- **If Fuse is Not Open:** Repair the Fused B(+) circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE (Z2) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Turn the ignition off.
2. Connect the positive lead of the load test tool to a 12 volt circuit at the ECU/component harness connector.
3. Connect the negative lead of the load test tool to the ground circuit at the ECU/component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

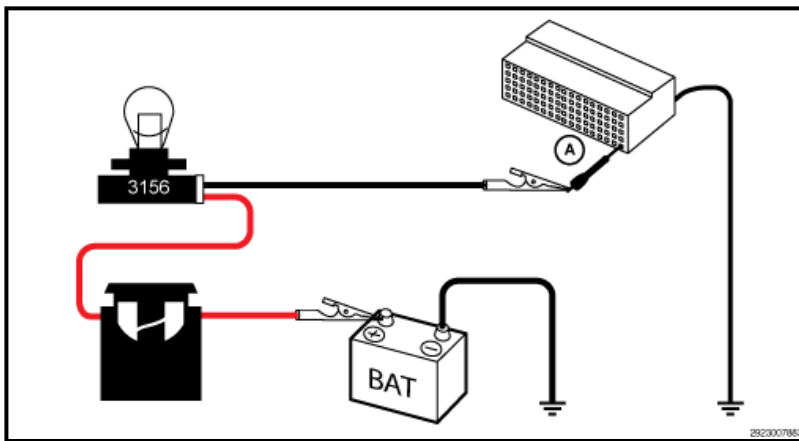
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance. Using the wiring diagrams as a guide, make sure to also inspect any related in-line connectors or splice connections.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D401) LIN BUS 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. RECONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE VOLTAGE ON THE (D401) LIN BUS 1 CIRCUIT AT THE IBS

1. Connect the disconnected Electronic Control Unit (ECU) harness connectors containing the circuit being tested.
2. Turn the ignition on.
3. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Visually inspect the negative battery cable connection to the Intelligent Battery Sensor (IBS) for any damage or corrosion and repair as needed. If no problems are found, replace the Intelligent Battery Sensor (IBS) in accordance with the Service Information. Refer to [SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION](#) [SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U114F-00-LOST COMMUNICATION WITH LIN OVERHEAD CONSOLE

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module (BCM) does not receive LIN Bus 2 messages from the Overhead Console Module for greater than three seconds.

DEFAULT ACTION

- Functionality related to the Overhead Console Module will be inoperative.

POSSIBLE CAUSES

Possible Causes
FUSED B(+) CIRCUIT OPEN OR SHORTED TO GROUND
LIN BUS 2 CIRCUIT OPEN
GROUND CIRCUIT OPEN
OVERHEAD CONSOLE MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE OVERHEAD CONSOLE MODULE HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE FUSED B(+) CIRCUIT

1. Turn the ignition off.
2. Disconnect the component harness connector for the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the voltage greater than 10.0 volts?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or short to ground. Use the wiring diagram as a guide to trace the circuit and look for any fuses and in-line connectors to help isolate the location of the open or short to ground.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE OVERHEAD CONSOLE MODULE GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
2. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

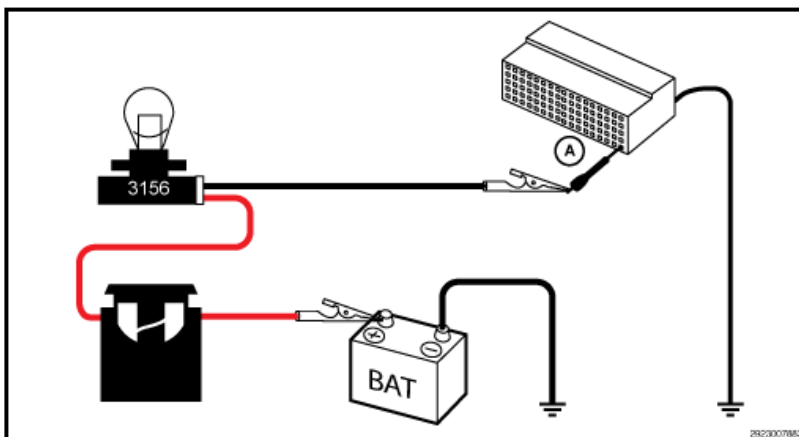
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK THE VOLTAGE ON THE (D402) LIN BUS 2 CIRCUIT AT THE OVERHEAD CONSOLE MODULE HARNESS CONNECTOR

1. Turn the ignition on.
2. Using a DVOM, measure the voltage on the circuit being tested at component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Replace the Overhead Console Module in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. DISCONNECT THE BCM HARNESS CONNECTOR AND CHECK THE (D402) LIN BUS 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

U1191-00-LOST COMMUNICATION WITH SWITCH BANK MODULE 2

For a complete MESSAGE SYSTEMS wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The Body Control Module (BCM) does not receive LIN Bus 1 messages from the Switch Bank Module 2 for greater than three seconds.

DEFAULT ACTION

- Functionality related to the Switch Bank 2 Module will be inoperative.

POSSIBLE CAUSES

Possible Causes
FUSED B(+) CIRCUIT OPEN OR SHORTED TO GROUND
LIN BUS 1 CIRCUIT OPEN
GROUND CIRCUIT OPEN
SWITCH BANK MODULE 2
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Diagnose and repair any other LIN Bus related DTCs before proceeding with this diagnostic procedure.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE UPPER SWITCH BANK MODULE 2 HARNESS CONNECTOR AND CHECK FOR VOLTAGE ON THE (A232) FUSED B(+) CIRCUIT

1. Disconnect the component harness connector to isolate the Fused B(+) circuit.

2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

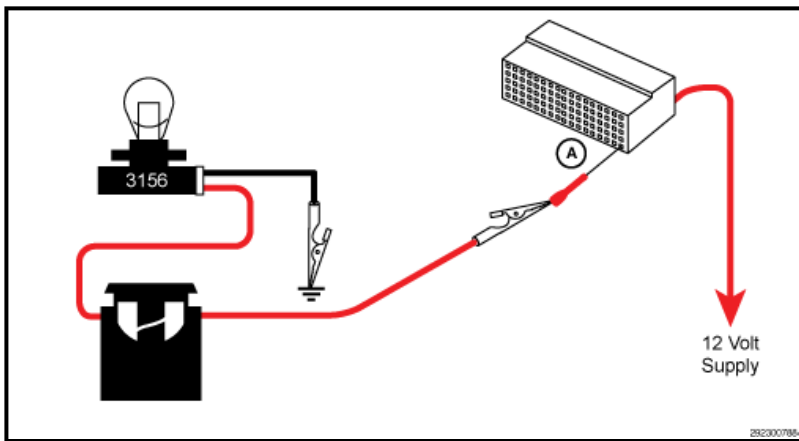
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Remove the Fuse for the Switch Bank 2 Module and inspect it for an open.
- **If Fuse Is Good:** Install the Fuse that was removed and repair the open or high resistance in the Fused Ignition circuit. Using the wiring diagrams as a guide inspect the circuit, related in-line connectors and splice connections for an open or high resistance.
- **If Fuse Is Open:** Repair the short to ground in the Fused Ignition circuit. Using the wiring diagrams as a guide inspect the circuit, related in-line connectors and splice connections for a short. Replace the Fuse that was removed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE (Z910) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Connect the positive lead of the load test tool to a 12 volt circuit at the component harness connector.
2. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

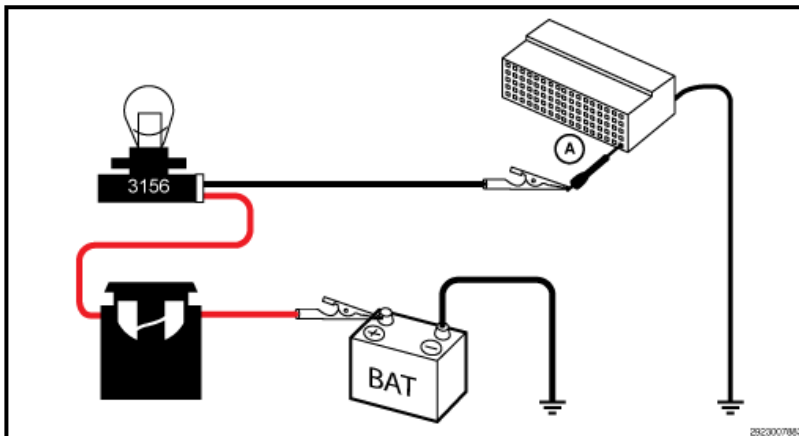
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 Bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 Bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance. Using the wiring diagrams as a guide, make sure to also inspect any related in-line connectors or splice connections.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (D401) LIN BUS 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the resistance of a circuit.
2. Disconnect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. RECONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE VOLTAGE ON THE (D401) LIN BUS 1 CIRCUIT AT THE SWITCH BANK MODULE 2

1. Connect all Electronic Control Unit (ECU) harness connectors containing the circuit being tested.
2. Turn the ignition on.
3. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Replace the Switch Bank Module 2 in accordance with the Service Information. Refer to [POD, SWITCH, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. DISCONNECT RELATED MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U11B9-00-LOST COMMUNICATION WITH RF HUB

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1433-23-IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL STUCK LOW

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors the hard-wired Ignition Signal circuit from the Radio Frequency (RF) Hub Module and compares it to the ignition switch status message received from the RF Hub Module over the Controller Area Network (CAN) Bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects the hard-wired input from the Radio Frequency (RF) Hub Module does not match the Ignition Status CAN Bus message from the RF Hub Module for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
IGNITION STATUS CIRCUIT SHORTED TO GROUND RADIO FREQUENCY (RF) HUB MODULE BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE RF HUB MODULE HARNESS CONNECTOR - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition off.

2. Disconnect the indicated Electronic Control Unit (ECU) harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND CHECK THE (F20) IGNITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

NOTE: The ignition must be off when checking a circuit for continuity to ground.

1. Disconnect the indicated ECU harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
2. Connect the negative lead of the DVOM to a known good ground.
3. Connect the positive lead of the DVOM to the circuit being tested at the ECU harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

4. DISCONNECT RELATED RF HUB MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all RF Hub harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all RF Hub harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the RF Hub Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U1433-24-IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL STUCK HIGH

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Body Control Module (BCM) monitors the hard-wired Ignition Signal circuit from the Radio Frequency (RF) Hub Module and compares it to the ignition switch status message received from the RF Hub Module over the Controller Area Network (CAN) Bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) detects the hard-wired input from the Radio Frequency (RF) Hub Module does not match the Ignition Status CAN Bus message from the RF Hub Module for greater than five seconds.

POSSIBLE CAUSES

Possible Causes
IGNITION STATUS CIRCUIT OPEN OR SHORTED TO VOLTAGE
RADIO FREQUENCY (RF) HUB MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE**.

2. DISCONNECT THE BCM HARNESS CONNECTOR(S) AND MEASURE THE VOLTAGE ON THE (F20) IGNITION STATUS CIRCUIT

1. Turn the ignition off.
2. Disconnect the indicated ECU harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition to the ACC position
4. Using a DVOM, measure the voltage on the circuit being tested at the ECU harness connector.

NOTE:

When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. DISCONNECT THE RF HUB MODULE HARNESS CONNECTOR AND CHECK THE (F20) IGNITION STATUS CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the indicated ECU harness connector(s) containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the ECU harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Go To [5](#)

4. DISCONNECT THE RF HUB MODULE HARNESS CONNECTOR AND CHECK THE (F20) IGNITION STATUS CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

NOTE: The ignition must be off when checking the resistance of a circuit.

NOTE: Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. Note: The meter leads can add resistance to the measurement value.

1. Connect one lead of the DVOM to the circuit being tested at one of the ECU harness connectors.
2. Connect the other lead to the circuit being tested at the other ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector terminals.

Is the resistance above 3.0 Ohms?

Yes

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Go To [6](#)

5. DISCONNECT RELATED RF HUB MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all RF Hub harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all RF Hub harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the RF Hub Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

6. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

U1514-64-ENGINE CONTROLLER SECRET CODE - SIGNAL PLAUSIBILITY FAILURE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) receives an invalid Immobilizer System message from the Powertrain Control Module (PCM).

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM) DTCS
INCORRECT VIN PROGRAMMED IN THE PCM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK FOR STARTING RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Turn the ignition on.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any starting DTCs in the PCM?

Yes

- Repair the Powertrain Control Module (PCM) DTCs. Refer to the appropriate service information .

No

- Go To [3](#)

3. VERIFY THE VEHICLE IDENTIFICATION NUMBER (VIN) STORED IN THE POWERTRAIN CONTROL MODULE (PCM) MATCHES THE VEHICLE AND THE VIN STORED IN THE BCM

NOTE: **Verify a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.**

1. With the scan tool, access the VIN stored in the PCM.
2. Compare the VIN displayed in the PCM, with the VIN of the vehicle.
3. With the scan tool, access the VIN in the BCM.

Does the VIN in the PCM match the BCM and the vehicle VINs?

Yes

- Go To [4](#)

No

- With the scan tool, perform the PCM programming procedure to update the VIN in the PCM. Refer to **MODULE, POWERTRAIN CONTROL (PCM), MODULE PROGRAMMING** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT RELATED PCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U1514-87-ENGINE CONTROLLER SECRET CODE - MISSING MESSAGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive a Immobilizer System message from the Powertrain Control Module (PCM).

POSSIBLE CAUSES

Possible Causes
MAIN OR AUXILIARY 12-VOLT BATTERY
POWERTRAIN CONTROL MODULE (PCM) DTCS
POWERTRAIN CONTROL MODULE (PCM) PROGRAMMING

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: This diagnostic procedure diagnoses single battery or dual battery systems. Proceed as equipped.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE OPERATION OF THE 12-VOLT MAIN BATTERY AND AUXILIARY BATTERY (IF EQUIPPED)

NOTE: This DTC may also set if the 12-volt Main Battery, or Auxiliary Battery, does not operate properly.

1. Check the 12.0 Volt Main Battery, and Auxiliary Battery (if equipped), for proper operation. Refer to the appropriate service information .

Does the 12-volt Main Battery, and Auxiliary Battery, operate properly?

Yes

- Go To [3](#)

No

- Repair or replace the inoperative Battery (Main or Auxiliary) in accordance with the Service Information. Refer to [BATTERY, REMOVAL AND INSTALLATION BATTERY, SUPPLEMENTAL, REMOVAL AND INSTALLATION BATTERY, REMOVAL AND INSTALLATION BATTERY, SUPPLEMENTAL, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. 0 [BODY VERIFICATION TEST](#).

3. CHECK FOR STARTING, CHARGING OR IGNITION RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Turn the ignition on.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any starting, ignition or charging DTCs in the PCM?

Yes

- Repair the Powertrain Control Module (PCM) DTCs. Refer to the appropriate service information .

No

- With the scan tool, perform the PCM programming procedure. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), MODULE PROGRAMMING](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

U1515-62-STEERING COLUMN LOCK SECRET CODE - SIGNAL COMPARE FAILURE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) receives an invalid Immobilizer System message from the Electronic Steering Lock (ESL).

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL)
IMMOBILIZER SYSTEM RELATED DTCS
BODY CONTROL MODULE (BCM) NOT PROGRAMMED CORRECTLY
BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. VERIFY THE ELECTRONIC STEERING LOCK (ESL) IS ACTIVE ON THE BUS

1. With the scan tool, verify the ESL is active on the bus.

Is the ESL active on the bus?

Yes

- Go To [3](#)

No

- Perform the NO RESPONSE FROM ECU diagnostic procedure for the ESL. Refer to [DIAGNOSIS AND TESTING](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR ANY ACTIVE IMMOBILIZER SYSTEM RELATED DTCS IN ALL MODULES

NOTE: Check for BCM configuration, VIN Missing/Mismatch or Immobilizer System related DTCs.

1. With the scan tool, read all active DTCs from all modules.

Are there any Immobilizer System related DTCs present?

Yes

- Perform the appropriate diagnostic procedure.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. PERFORM THE BCM RESTORE VEHICLE CONFIGURATION PROCEDURE

1. Perform the BCM "RESTORE VEHICLE CONFIGURATION" procedure, located in BCM MISC FUNCTIONS.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.

4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

U1515-64-STEERING COLUMN LOCK SECRET CODE - SIGNAL PLAUSIBILITY FAILURE WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) receives an invalid Sentry Key Immobilizer System (SKIS) message from the Electronic Steering Lock (ESL).

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) SKIS RELATED DTCS BODY CONTROL MODULE (BCM) NOT PROGRAMMED CORRECTLY BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. VERIFY THE ELECTRONIC STEERING LOCK (ESL) IS ACTIVE ON THE BUS

1. With the scan tool, verify the ESL is active on the bus.

Is the ESL active on the bus?

Yes

- Go To [3](#)

No

- Perform the NO RESPONSE FROM ECU diagnostic procedure for the ESL. Refer to **DIAGNOSIS AND TESTING**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. CHECK FOR ANY ACTIVE IMMOBILIZER SYSTEM RELATED DTCS IN ALL MODULES

NOTE: Check for BCM configuration, VIN Missing/Mismatch or Immobilizer System related DTCs.

1. With the scan tool, read all active DTCs from all modules.

Are there any Immobilizer System related DTCs present?

Yes

- Perform the appropriate diagnostic procedure.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. PERFORM THE BCM RESTORE VEHICLE CONFIGURATION PROCEDURE

1. Perform the BCM "RESTORE VEHICLE CONFIGURATION" procedure, located in BCM MISC FUNCTIONS.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U1515-87-STEERING COLUMN LOCK SECRET CODE - MISSING MESSAGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive a Immobilizer System message from the Electronic Steering Lock (ESL).

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL)
IMMOBILIZER SYSTEM RELATED DTCS
BODY CONTROL MODULE (BCM) NOT PROGRAMMED CORRECTLY
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. VERIFY THE ELECTRONIC STEERING LOCK (ESL) IS ACTIVE ON THE BUS

1. With the scan tool, verify the ESL is active on the bus.

Is the ESL active on the bus?

Yes

- Go To [3](#)

No

- Perform the NO RESPONSE FROM ECU diagnostic procedure for the ESL. Refer to **DIAGNOSIS AND TESTING** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK FOR ANY ACTIVE IMMOBILIZER SYSTEM RELATED DTCS IN ALL MODULES

NOTE: Check for BCM configuration, VIN Missing/Mismatch or Immobilizer System related DTCS.

1. With the scan tool, read all active DTCS from all modules.

Are there any Immobilizer System related DTCs present?

Yes

- Perform the appropriate diagnostic procedure.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. PERFORM THE BCM RESTORE VEHICLE CONFIGURATION PROCEDURE

1. Perform the BCM "RESTORE VEHICLE CONFIGURATION" procedure, located in BCM MISC FUNCTIONS.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

5. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U1516-64-RF HUB SECRET CODE - SIGNAL PLAUSIBILITY FAILURE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) receives an invalid Immobilizer System message from the Radio Frequency (RF Hub) Module.

POSSIBLE CAUSES

Possible Causes
IMMOBILIZER SYSTEM RELATED DTCS
ADDITIONAL COMMUNICATION RELATED DTCS
BODY CONTROL MODULE (BCM) NOT PROGRAMMED CORRECTLY
RADIO FREQUENCY (RF HUB) MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK FOR ANY ACTIVE IMMOBILIZER SYSTEM RELATED DTCS IN ALL MODULES

NOTE: Check for BCM configuration, VIN Missing/Mismatch or Immobilizer System related DTCs.

1. With the scan tool, read all active DTCs from all modules.

Are there any Immobilizer System related DTCs present?

Yes

- Perform the appropriate diagnostic procedure.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. VERIFY THE RADIO FREQUENCY (RF HUB) MODULE IS ACTIVE ON THE BUS

1. With the scan tool, verify the RF Hub Module is active on the bus.

Is the RF Hub Module active on the bus?

Yes

- Go To [4](#)

No

- Perform the NO RESPONSE FROM ECU diagnostic procedure for the RF Hub Module. Refer to **DIAGNOSIS AND TESTING** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS IN ALL MODULES

1. With the scan tool, read all active DTCs from all modules.

Is there more than one module with active DTCs "Logged Against" the RF Hub Module?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. PERFORM THE BCM RESTORE VEHICLE CONFIGURATION PROCEDURE

1. Perform the BCM "RESTORE VEHICLE CONFIGURATION" procedure, located in BCM MISC FUNCTIONS.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read Body Control Module (BCM) DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

6. DISCONNECT RELATED RF HUB MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all RF Hub Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all RF Hub Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency (RF Hub) Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

U1516-87-RF HUB SECRET CODE - MISSING MESSAGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the Run position.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) does not receive an Immobilizer System message from the Radio Frequency (RF Hub) Module.

POSSIBLE CAUSES

Possible Causes
IMMOBILIZER SYSTEM RELATED DTCS
ADDITIONAL COMMUNICATION RELATED DTCS
BODY CONTROL MODULE (BCM) NOT PROGRAMMED CORRECTLY
RADIO FREQUENCY (RF HUB) MODULE
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK FOR ANY ACTIVE IMMOBILIZER SYSTEM RELATED DTCS IN ALL MODULES

NOTE: Check for BCM configuration, VIN Missing/Mismatch or Immobilizer System related DTCS.

1. With the scan tool, read all active DTCS from all modules.

Are there any Immobilizer System related DTCS present?

Yes

- Perform the appropriate diagnostic procedure.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. VERIFY THE RADIO FREQUENCY (RF HUB) MODULE IS ACTIVE ON THE BUS

1. With the scan tool, verify the RF Hub Module is active on the bus.

Is the RF Hub Module active on the bus?

Yes

- Go To [4](#)

No

- Perform the NO RESPONSE FROM ECU diagnostic procedure for the RF Hub Module. Refer to [DIAGNOSIS AND TESTING](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS IN ALL MODULES

1. With the scan tool, read all active DTCS from all modules.

Is there more than one module with active DTCS "Logged Against" the RF Hub Module?

Yes

- Go To [6](#)

No

- Go To [5](#)

5. PERFORM THE BCM RESTORE VEHICLE CONFIGURATION PROCEDURE

1. Perform the BCM "RESTORE VEHICLE CONFIGURATION" procedure, located in BCM MISC FUNCTIONS.
2. With the scan tool, erase all DTCS.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read Body Control Module (BCM) DTCS.

Did the DTC return?

Yes

- Go To [7](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

6. DISCONNECT RELATED RF HUB MODULE HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all RF Hub Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all RF Hub Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency (RF Hub) Module in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

- Test complete.

7. DISCONNECT RELATED BCM HARNESS CONNECTIONS AND INSPECT FOR PROBLEMS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read BCM DTCs.

Did the DTC return?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
 - Test complete.
-

2021 GENERAL INFORMATION

(Central Vision Processing Module (CVPM) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B217A-1C	REAR CAMERA-CIRCUIT VOLTAGE OUT OF RANGE
B217A-92	REAR CAMERA-PERFORMANCE OR INCORRECT OPERATION
B2199-16	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
B2199-17	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
B21DD-84	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
B21DD-85	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
B222C-00	VEHICLE CONFIGURATION NOT PROGRAMMED
B223B-00	VEHICLE CONFIGURATION MISMATCH
B22A9-00	ECU INTERNAL PERFORMANCE
B23C5-1C	FRONT CAMERA-CIRCUIT VOLTAGE OUT OF RANGE
B23C5-92	FRONT CAMERA-PERFORMANCE OR INCORRECT OPERATION
U0010-00	CAN INTERIOR BUS
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0184-00	LOST COMMUNICATION WITH RADIO
U0264-00	LOST COMMUNICATION WITH CAMERA MODULE-REAR
U0265-00	LOST COMMUNICATION WITH FRONT CAMERA
U0422-00	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
U0485-00	IMPLAUSIBLE DATA RECEIVED FROM RADIO

DIAGNOSIS AND TESTING

B217A-1C-REAR CAMERA-CIRCUIT VOLTAGE OUT OF RANGE

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Central Vision Processing Module (CVPM) detected that the camera voltage is out of range.

DEFAULT ACTION

- The camera video image is blanked out on video screen.

POSSIBLE CAUSES

Possible Causes
CVPM SUPPLY VOLTAGE OUT OF RANGE LVDS COAX CABLE UNPLUGGED OR DAMAGED LVDS COAX CABLE SHORTED TO VOLTAGE CAMERA CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Camera Circuits

Circuit ID	Circuit Description
J220	REAR

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Verify that the Central Vision Processing Module (CVPM) has the latest software installed. If necessary, update the software and retest.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCs set in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To **3**

3. CHECK THE OPERATION OF ALL CAMERAS CONNECTED TO THE CVPM

NOTE: The Surround View Camera System may use two or more connected cameras through LVDS (Low Voltage Differential Signal) Coaxial Cable.

1. Activate the Surround View Camera System by pressing the Surround View Camera soft key located in the "Controls" screen within the Uconnect system.
2. Compare the operation of all the connected cameras to the CVPM, and confirm at least one camera is operating and functioning normally.

Is one camera operating and functioning normally?

Yes

- Go To **5**

No

- Go To **4**

4. CHECK THE RELATED COAX CABLE CONNECTIONS

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: Some vehicles are not be equipped with a camera at each location specified below.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. Turn the ignition off.
2. Inspect the CVPM harness connector for a secure and undamaged connection.
3. Inspect the Coax Cable in-line harness connectors for a secure and undamaged connection.
4. Inspect the related Camera harness connector for a secure and undamaged connection.

Are the connections secure and undamaged?

Yes

- Go To **5**

No

- Repair the cable connection as needed and check video operation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. CHECK THE CVPM

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: The following test is being used to determine that the CVPM recognizes a known good camera, cable and the related connections.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. On the vehicle, identify and locate the faulted circuit connector for testing at the CVPM.

NOTE: For example, a fault setting for the Front Camera would indicate the **GREEN** connector at the CVPM.

2. Disconnect the connector at the CVPM for the faulted circuit being set against.
3. On the vehicle, identify and locate a known good operating and functioning camera, circuit and related connector at the CVPM.
4. Disconnect the connector at the CVPM for a known good operating and functioning camera.

NOTE: Continuing with the example, if a fault was setting against the Front Camera; and the Rear Camera is operating and functioning normally on the vehicle - disconnect the Rear Camera connector (**ORANGE** connector) at the CVPM to further test with.

5. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the 9977-6-8-2 test lead to the 9977-6-8-3 test lead.
6. Connect the other end of the 9977-6-8-2 test lead to the CVPM connection for the fault related camera circuit.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-2 test lead would connect to the **GREEN** connector on the CVPM. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

7. Connect the other end of the 9977-6-8-3 test lead to the coaxial cable going to the known good operating and functioning camera.

NOTE: In the example, the BLUE connector from the 9977-6-8-3 test lead would connect to the ORANGE connector going to the Rear Camera. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

8. Check the activity status of the camera and fault status.

NOTE: In the example, the status of the Front Camera should show an active image (possibly inverted - due to orientation) of the known good camera circuit being used. The related DTCs for the Front Camera should change to STORED. In this example the CVPM would then show no active image and would show ACTIVE DTCs set against the Rear Camera with no connection being present.

Did camera activity return and the status of the original setting DTC(s) change to Stored?

Yes

- A known good camera, cable, and connection was used for testing and the CVPM is no longer a possible cause. The camera and cable are the remaining possible causes.
- Go To [6](#)

No

- A known good camera, cable, and connection was used for testing and the CVPM is the only remaining cause.
- Go To [7](#)

6. TEST THE COAX CABLE BETWEEN THE CVPM AND RELATED CAMERA

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

1. Turn the ignition off.
2. Disconnect the 9977-6-8-2 and the 9977-6-8-3 test leads from the vehicle.
3. Reconnect the known connector for the known good operating and functioning camera circuit used for testing previously.

NOTE: In the example, the Rear Camera connector (ORANGE connector) was disconnected at the CVPM for testing purposes.

4. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the long cable (9977-6-8-1) between the related Camera and the CVPM connector.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Camera in accordance with the service information. Refer to [**CAMERA, REAR, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Replace the Coax Cable in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [**MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

- Test complete.

B217A-92-REAR CAMERA-PERFORMANCE OR INCORRECT OPERATION

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Central Vision Processing Module (CVPM) detects video connection between the Camera and the module is not present.

DEFAULT ACTION

- The camera video image is blanked out on the video screen.

POSSIBLE CAUSES

Possible Causes
CVPM SUPPLY VOLTAGE OUT OF RANGE
LVDS COAX CABLE OPEN OR DISCONNECTED
CAMERA
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

CIRCUITS TO BE TESTED

Camera Circuits

Circuit ID	Circuit Description
J220	REAR

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Verify that the Central Vision Processing Module (CVPM) has the latest software installed. If necessary, update the software and retest.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCs set in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#).

No

- Go To [3](#)

3. CHECK THE OPERATION OF ALL CAMERAS CONNECTED TO THE CVPM

NOTE: The Surround View Camera System may use two or more connected cameras through LVDS (Low Voltage Differential Signal) Coaxial Cable.

1. Activate the Surround View Camera System by pressing the Surround View Camera soft key located in the "Controls" screen within the Uconnect system.
2. Compare the operation of all the connected cameras to the CVPM, and confirm at least one camera is operating and functioning normally.

Is one camera operating and functioning normally?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE RELATED COAX CABLE CONNECTIONS

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected

the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: Some vehicles are not be equipped with a camera at each location specified below.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. Turn the ignition off.
2. Inspect the CVPM harness connector for a secure and undamaged connection.
3. Inspect the Coax Cable in-line harness connectors for a secure and undamaged connection.
4. Inspect the related Camera harness connector for a secure and undamaged connection.

Are the connections secure and undamaged?

Yes

- Go To [5](#)

No

- Repair the cable connection as needed and check video operation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK THE CVPM

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: The following test is being used to determine that the CVPM recognizes a known good camera, cable and the related connections.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. On the vehicle, identify and locate the faulted circuit connector for testing at the CVPM.

NOTE: For example, a fault setting for the Front Camera would indicate the **GREEN** connector at the CVPM.

2. Disconnect the connector at the CVPM for the faulted circuit being set against.
3. On the vehicle, identify and locate a known good operating and functioning camera, circuit and related connector at the CVPM.
4. Disconnect the connector at the CVPM for a known good operating and functioning camera.

NOTE: Continuing with the example, if a fault was setting against the Front Camera; and the Rear Camera is operating and functioning normally on the vehicle - disconnect the Rear Camera connector (**ORANGE** connector) at the CVPM to further test with.

5. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the 9977-6-8-2 test lead to the 9977-6-8-3 test lead.
6. Connect the other end of the 9977-6-8-2 test lead to the CVPM connection for the fault related camera circuit.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-2 test lead would connect to the **GREEN** connector on the CVPM. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

7. Connect the other end of the 9977-6-8-3 test lead to the coaxial cable going to the known good operating and functioning camera.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-3 test lead would connect to the **ORANGE** connector going to the Rear Camera. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

8. Check the activity status of the camera and fault status.

NOTE: In the example, the status of the Front Camera should show an active image (possibly inverted - due to orientation) of the known good camera circuit being used. The related DTCs for the Front Camera should change to **STORED**. In this example the CVPM would then show no active image and would show **ACTIVE** DTCs set against the Rear Camera with no connection being present.

Did camera activity return and the status of the original setting DTC(s) change to Stored?

Yes

- A known good camera, cable, and connection was used for testing and the CVPM is no longer a possible cause. The camera and cable are the remaining possible causes.
- Go To [6](#)

No

- A known good camera, cable, and connection was used for testing and the CVPM is the only remaining cause.
- Go To [7](#)

6. TEST THE COAX CABLE BETWEEN THE CVPM AND RELATED CAMERA

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

1. Turn the ignition off.
2. Disconnect the 9977-6-8-2 and the 9977-6-8-3 test leads from the vehicle.
3. Reconnect the known connector for the known good operating and functioning camera circuit used for testing previously.

NOTE: In the example, the Rear Camera connector (ORANGE connector) was disconnected at the CVPM for testing purposes.

4. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the long cable (9977-6-8-1) between the related Camera and the CVPM connector.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Camera in accordance with the service information. Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Coax Cable in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The supply voltage is below 7.5 volts (+/- 0.5 volts).

DEFAULT ACTION

- Functionality severely limited.

POSSIBLE CAUSES

Possible Causes
ECU POWER SUPPLY CIRCUIT EXCESSIVE RESISTANCE

Possible Causes
GROUND CIRCUIT EXCESSIVE RESISTANCE
CHARGING OR BATTERY VOLTAGE LOW
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCs present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. ISOLATE AND LOAD TEST THE (F928) IGNITION RUN OUTPUT CIRCUIT TO CHECK FOR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). Refer to the diagram below.

4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

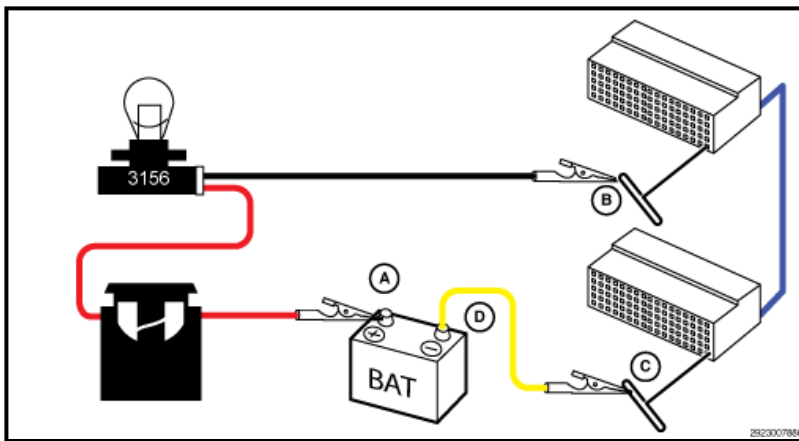
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright for each circuit tested?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK THE (Z916) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load

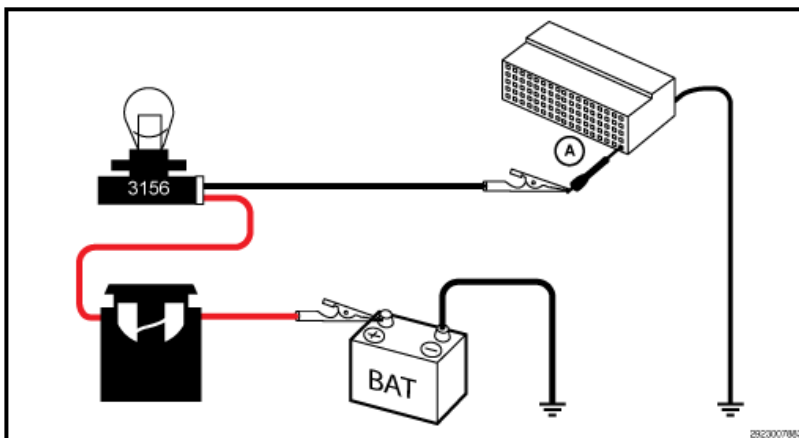
testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The supply voltage is above 16.5 volts (+/- 0.5 volts).

DEFAULT ACTION

- Functionality severely limited.

POSSIBLE CAUSES

Possible Causes
CHARGING OR BATTERY VOLTAGE HIGH

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCs present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To **3**

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The system voltage value received by the module over the CAN bus is below 10.0 volts.

DEFAULT ACTION

- Functionality severely limited.

POSSIBLE CAUSES

Possible Causes
CHARGING OR BATTERY VOLTAGE LOW
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCS present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#), or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCS.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCS.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The system voltage value received by the module over the CAN bus is above 16.0 volts.

DEFAULT ACTION

- Functionality severely limited.

POSSIBLE CAUSES

Possible Causes
CHARGING OR BATTERY VOLTAGE HIGH
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCs present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The vehicle configuration is not programmed or incorrect.

DEFAULT ACTION

- Camera View function is inoperative.

POSSIBLE CAUSES

Possible Causes
CVPM NOT CONFIGURED CORRECTLY
BODY CONTROL MODULE (BCM) NOT CONFIGURED CORRECTLY
CENTRAL VISION PROCESSING MODULE (CVPM)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CONFIGURE THE CVPM TO THE VEHICLE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, configure the CVPM to the vehicle.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read the CVPM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CONFIGURE THE BCM TO THE VEHICLE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, configure the BCM to the vehicle.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. VERIFY THE BCM HARDWARE AND SOFTWARE PART NUMBERS ARE CORRECT FOR THE VEHICLE

1. With the scan tool, read the BCM hardware and software part numbers and record them on the repair order.

Are the BCM hardware and software part numbers correct for the vehicle?

Yes

- Go To [5](#)

No

- Replace the BCM in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B223B-00-VEHICLE CONFIGURATION MISMATCH

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), DESCRIPTION AND OPERATION**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The module contains unexpected or incorrect vehicle configuration values.

DEFAULT ACTION

- Camera View is inoperative.

POSSIBLE CAUSES

Possible Causes
CVPM NOT CONFIGURED CORRECTLY BODY CONTROL MODULE (BCM) CENTRAL VISION PROCESSING MODULE (CVPM)

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CONFIGURE THE CVPM TO THE VEHICLE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, configure the CVPM to the vehicle.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read the CVPM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CONFIGURE THE BCM TO THE VEHICLE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, configure the BCM to the vehicle.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. VERIFY THE BCM HARDWARE AND SOFTWARE PART NUMBERS ARE CORRECT FOR THE VEHICLE

1. With the scan tool, read the BCM hardware and software part numbers and record them on the repair order.

Are the BCM hardware and software part numbers correct for the vehicle?

Yes

- Go To [5](#)

No

- Replace the BCM in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B22A9-00-ECU INTERNAL PERFORMANCE

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Central Vision Processing Module (CVPM) detects an internal hardware or software failure.

DEFAULT ACTION

- Flickering video image or no video image on display screen.

POSSIBLE CAUSES

Possible Causes
CVPM SUPPLY VOLTAGE OUT OF RANGE
CVPM SOFTWARE CORRUPT OR NOT COMPATIBLE
CENTRAL VISION PROCESSING MODULE (CVPM)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCs present in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#).

No

- Go To [3](#)

3. CHECK FOR SERVICE BULLETINS AND SOFTWARE UPDATES FOR THE CVPM

1. Refer to the latest Service Information.

Are any Service Bulletins or Software Updates available for the CVPM?

Yes

- Perform the appropriate procedure and retest.

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [**MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B23C5-1C-FRONT CAMERA-CIRCUIT VOLTAGE OUT OF RANGE

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [**MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Central Vision Processing Module (CVPM) detected that the camera voltage is out of range.

DEFAULT ACTION

- The camera video image is blanked out on video screen.

POSSIBLE CAUSES

Possible Causes
CVPM SUPPLY VOLTAGE OUT OF RANGE

Possible Causes

LVDS COAX CABLE UNPLUGGED OR DAMAGED
LVDS COAX CABLE SHORTED TO VOLTAGE
CAMERA
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

CIRCUITS TO BE TESTED

Camera Circuits

Circuit ID	Circuit Description
J222	FRONT

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Verify that the Central Vision Processing Module (CVPM) has the latest software installed. If necessary, update the software and retest.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCs set in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [3](#)

3. CHECK THE OPERATION OF ALL CAMERAS CONNECTED TO THE CVPM

NOTE: The Surround View Camera System may use two or more connected cameras through LVDS (Low Voltage Differential Signal) Coaxial Cable.

1. Activate the Surround View Camera System by pressing the Surround View Camera soft key located in the "Controls" screen within the Uconnect system.
2. Compare the operation of all the connected cameras to the CVPM, and confirm at least one camera is operating and functioning normally.

Is one camera operating and functioning normally?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE RELATED COAX CABLE CONNECTIONS

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: Some vehicles are not be equipped with a camera at each location specified below.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. Turn the ignition off.
2. Inspect the CVPM harness connector for a secure and undamaged connection.
3. Inspect the Coax Cable in-line harness connectors for a secure and undamaged connection.
4. Inspect the related Camera harness connector for a secure and undamaged connection.

Are the connections secure and undamaged?

Yes

- Go To [5](#)

No

- Repair the cable connection as needed and check video operation.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

5. CHECK THE CVPM

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: The following test is being used to determine that the CVPM recognizes a known good camera, cable and the related connections.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. On the vehicle, identify and locate the faulted circuit connector for testing at the CVPM.

NOTE: For example, a fault setting for the Front Camera would indicate the **GREEN** connector at the CVPM.

2. Disconnect the connector at the CVPM for the faulted circuit being set against.
3. On the vehicle, identify and locate a known good operating and functioning camera, circuit and related connector at the CVPM.
4. Disconnect the connector at the CVPM for a known good operating and functioning camera.

NOTE: Continuing with the example, if a fault was setting against the Front Camera; and the Rear Camera is operating and functioning normally on the vehicle - disconnect the Rear Camera connector (**ORANGE** connector) at the CVPM to further test with.

5. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the 9977-6-8-2 test lead to the 9977-6-8-3 test lead.
6. Connect the other end of the 9977-6-8-2 test lead to the CVPM connection for the fault related camera circuit.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-2 test lead would connect to the **GREEN** connector on the CVPM. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

7. Connect the other end of the 9977-6-8-3 test lead to the coaxial cable going to the known good operating and functioning camera.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-3 test lead would connect to the **ORANGE** connector going to the Rear Camera. We are using a known good camera, cable, and connection from the

Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

8. Check the activity status of the camera and fault status.

NOTE: In the example, the status of the Front Camera should show an active image (possibly inverted - due to orientation) of the known good camera circuit being used. The related DTCs for the Front Camera should change to STORED. In this example the CVPM would then show no active image and would show ACTIVE DTCs set against the Rear Camera with no connection being present.

Did camera activity return and the status of the original setting DTC(s) change to Stored?

Yes

- A known good camera, cable, and connection was used for testing and the CVPM is no longer a possible cause. The camera and cable are the remaining possible causes.
- Go To [6](#)

No

- A known good camera, cable, and connection was used for testing and the CVPM is the only remaining cause.
- Go To [7](#)

6. TEST THE COAX CABLE BETWEEN THE CVPM AND RELATED CAMERA

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

1. Turn the ignition off.
2. Disconnect the 9977-6-8-2 and the 9977-6-8-3 test leads from the vehicle.
3. Reconnect the known connector for the known good operating and functioning camera circuit used for testing previously.

NOTE: In the example, the Rear Camera connector (ORANGE connector) was disconnected at the CVPM for testing purposes.

4. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the long cable (9977-6-8-1) between the related Camera and the CVPM connector.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Camera in accordance with the service information. Refer to [**CAMERA, REAR, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Replace the Coax Cable in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [**MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B23C5-92-FRONT CAMERA-PERFORMANCE OR INCORRECT OPERATION

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to MODULE, CENTRAL VISION PROCESSING (CVPM), DESCRIPTION AND OPERATION .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Central Vision Processing Module (CVPM) detects video connection between the Camera and the module is not present.

DEFAULT ACTION

- The camera video image is blanked out on the video screen.

POSSIBLE CAUSES

Possible Causes
CVPM SUPPLY VOLTAGE OUT OF RANGE
LVDS COAX CABLE OPEN OR DISCONNECTED
CAMERA
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

CIRCUITS TO BE TESTED

Camera Circuits

Circuit ID	Circuit Description
J222	FRONT

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Verify that the Central Vision Processing Module (CVPM) has the latest software installed. If necessary, update the software and retest.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCs set in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [3](#)

3. CHECK THE OPERATION OF ALL CAMERAS CONNECTED TO THE CVPM

NOTE: **The Surround View Camera System may use two or more connected cameras through LVDS (Low Voltage Differential Signal) Coaxial Cable.**

1. Activate the Surround View Camera System by pressing the Surround View Camera soft key located in the "Controls" screen within the Uconnect system.
2. Compare the operation of all the connected cameras to the CVPM, and confirm at least one camera is operating and functioning normally.

Is one camera operating and functioning normally?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE RELATED COAX CABLE CONNECTIONS

NOTE: **When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be**

reflected on the data display as well for assisting in further troubleshooting.

NOTE: Some vehicles are not be equipped with a camera at each location specified below.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. Turn the ignition off.
2. Inspect the CVPM harness connector for a secure and undamaged connection.
3. Inspect the Coax Cable in-line harness connectors for a secure and undamaged connection.
4. Inspect the related Camera harness connector for a secure and undamaged connection.

Are the connections secure and undamaged?

Yes

- Go To [5](#)

No

- Repair the cable connection as needed and check video operation.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. CHECK THE CVPM

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e. Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

NOTE: The following test is being used to determine that the CVPM recognizes a known good camera, cable and the related connections.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. On the vehicle, identify and locate the faulted circuit connector for testing at the CVPM.

NOTE: For example, a fault setting for the Front Camera would indicate the GREEN connector at the CVPM.

2. Disconnect the connector at the CVPM for the faulted circuit being set against.
3. On the vehicle, identify and locate a known good operating and functioning camera, circuit and related connector at the CVPM.
4. Disconnect the connector at the CVPM for a known good operating and functioning camera.

NOTE: Continuing with the example, if a fault was setting against the Front Camera; and the Rear Camera is operating and functioning normally on the vehicle - disconnect the Rear Camera connector (ORANGE connector) at the CVPM to further test with.

5. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the 9977-6-8-2 test lead to the 9977-6-8-3 test lead.
6. Connect the other end of the 9977-6-8-2 test lead to the CVPM connection for the fault related camera circuit.

NOTE: In the example, the BLUE connector from the 9977-6-8-2 test lead would connect to the GREEN connector on the CVPM. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

7. Connect the other end of the 9977-6-8-3 test lead to the coaxial cable going to the known good operating and functioning camera.

NOTE: In the example, the BLUE connector from the 9977-6-8-3 test lead would connect to the ORANGE connector going to the Rear Camera. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

8. Check the activity status of the camera and fault status.

NOTE: In the example, the status of the Front Camera should show an active image (possibly inverted - due to orientation) of the known good camera circuit being used. The related DTCs for the Front Camera should change to STORED. In this example the CVPM would then show no active image and would show ACTIVE DTCs set against the Rear Camera with no connection being present.

Did camera activity return and the status of the original setting DTC(s) change to Stored?

Yes

- A known good camera, cable, and connection was used for testing and the CVPM is no longer a possible cause. The camera and cable are the remaining possible causes.
- Go To [6](#)

No

- A known good camera, cable, and connection was used for testing and the CVPM is the only remaining cause.
- Go To [7](#)

6. TEST THE COAX CABLE BETWEEN THE CVPM AND RELATED CAMERA

NOTE: When using the diagnostic scan tool, the data display screen of the ECU will show voltage values for the cameras associated to the vehicle (i.e.

Front, Left, Right or Rear Camera Power). Under normal operating conditions the ECU will display 10.0 volts. If a camera is not connected the voltage value will show 10.0 volts. If the associated camera circuit is shorted (voltage, ground, etc.) those differing voltage results will be reflected on the data display as well for assisting in further troubleshooting.

1. Turn the ignition off.
2. Disconnect the 9977-6-8-2 and the 9977-6-8-3 test leads from the vehicle.
3. Reconnect the known connector for the known good operating and functioning camera circuit used for testing previously.

NOTE: In the example, the Rear Camera connector (ORANGE connector) was disconnected at the CVPM for testing purposes.

4. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the long cable (9977-6-8-1) between the related Camera and the CVPM connector.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Camera in accordance with the service information. Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Coax Cable in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

U0010-00-CAN INTERIOR BUS

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable CAN IHS Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0184-00-LOST COMMUNICATION WITH RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0264-00-LOST COMMUNICATION WITH CAMERA MODULE-REAR

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera

circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- Internal communication to camera is not available or disrupted.

DEFAULT ACTION

- Video image not available.

POSSIBLE CAUSES

Possible Causes
VIDEO CABLE OPEN OR DISCONNECTED REAR CAMERA CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Verify that the Central Vision Processing Module (CVPM) has the latest software installed. If necessary, update the software and retest.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCS set in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [3](#)

3. CHECK THE OPERATION OF ALL CAMERAS CONNECTED TO THE CVPM

NOTE: **The Surround View Camera System may use two or more connected cameras through LVDS (Low Voltage Differential Signal) Coaxial Cable.**

1. Activate the Surround View Camera System by pressing the Surround View Camera soft key located in the "Controls" screen within the Uconnect system.
2. Compare the operation of all the connected cameras to the CVPM, and confirm at least one camera is operating and functioning normally.

Is one camera operating and functioning normally?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE RELATED COAX CABLE CONNECTIONS

NOTE: **Some vehicles are not be equipped with a camera at each location specified below.**

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. Turn the ignition off.
2. Inspect the CVPM harness connector for a secure and undamaged connection.
3. Inspect the Coax Cable in-line harness connectors for a secure and undamaged connection.
4. Inspect the related Camera harness connector for a secure and undamaged connection.

Are the connections secure and undamaged?

Yes

- Go To [5](#)

No

- Repair the cable connection as needed and check video operation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK THE CVPM

NOTE: The following test is being used to determine that the CVPM recognizes a known good camera, cable and the related connections.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. On the vehicle, identify and locate the faulted circuit connector for testing at the CVPM.

NOTE: For example, a fault setting for the Front Camera would indicate the **GREEN** connector at the CVPM.

2. Disconnect the connector at the CVPM for the faulted circuit being set against.
3. On the vehicle, identify and locate a known good operating and functioning camera, circuit and related connector at the CVPM.
4. Disconnect the connector at the CVPM for a known good operating and functioning camera.

NOTE: Continuing with the example, if a fault was setting against the Front Camera; and the Rear Camera is operating and functioning normally on the vehicle - disconnect the Rear Camera connector (**ORANGE** connector) at the CVPM to further test with.

5. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the 9977-6-8-2 test lead to the 9977-6-8-3 test lead.
6. Connect the other end of the 9977-6-8-2 test lead to the CVPM connection for the fault related camera circuit.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-2 test lead would connect to the **GREEN** connector on the CVPM. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

7. Connect the other end of the 9977-6-8-3 test lead to the coaxial cable going to the known good operating and functioning camera.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-3 test lead would connect to the **ORANGE** connector going to the Rear Camera. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

8. Check the activity status of the camera and fault status.

NOTE: In the example, the status of the Front Camera should show an active image (possibly inverted - due to orientation) of the known good camera circuit being used. The related DTCs for the Front

Camera should change to STORED. In this example the CVPM would then show no active image and would show ACTIVE DTCs set against the Rear Camera with no connection being present.

Did camera activity return and the status of the original setting DTC(s) change to Stored?

Yes

- A known good camera, cable, and connection was used for testing and the CVPM is no longer a possible cause. The camera and cable are the remaining possible causes.
- Go To [6](#)

No

- A known good camera, cable, and connection was used for testing and the CVPM is the only remaining cause.
- Go To [7](#)

6. TEST THE COAX CABLE BETWEEN THE CVPM AND RELATED CAMERA

1. Turn the ignition off.
2. Disconnect the 9977-6-8-2 and the 9977-6-8-3 test leads from the vehicle.
3. Reconnect the known connector for the known good operating and functioning camera circuit used for testing previously.

NOTE: In the example, the Rear Camera connector (ORANGE connector) was disconnected at the CVPM for testing purposes.

4. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the long cable (9977-6-8-1) between the related Camera and the CVPM connector.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Camera in accordance with the service information. Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Coax Cable in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to [**MODULE, CENTRAL VISION PROCESSING \(CVPM\), REMOVAL AND INSTALLATION**](#).
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).
- Test complete.

U0265-00-LOST COMMUNICATION WITH FRONT CAMERA

For a complete SURROUND VIEW CAMERA SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Central Vision Processing Module (CVPM) uses two cameras located on the front and rear of the vehicle. The camera signals are sent via a coaxial cable to the CVPM. The CVPM monitors the camera and camera circuits for concerns.

For an in depth explanation of the CVPM system. Refer to [**MODULE, CENTRAL VISION PROCESSING \(CVPM\), DESCRIPTION AND OPERATION**](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- Internal communication to camera is not available or disrupted.

DEFAULT ACTION

- Video image not available.

POSSIBLE CAUSES

Possible Causes
VIDEO CABLE OPEN OR DISCONNECTED
FRONT CAMERA
CENTRAL VISION PROCESSING MODULE (CVPM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Verify that the Central Vision Processing Module (CVPM) has the latest software installed. If necessary, update the software and retest.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR SYSTEM VOLTAGE DTCS IN THE CVPM

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or system voltage DTCs set in the CVPM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [3](#)

3. CHECK THE OPERATION OF ALL CAMERAS CONNECTED TO THE CVPM

NOTE: The Surround View Camera System may use two or more connected cameras through LVDS (Low Voltage Differential Signal) Coaxial Cable.

1. Activate the Surround View Camera System by pressing the Surround View Camera soft key located in the "Controls" screen within the Uconnect system.
2. Compare the operation of all the connected cameras to the CVPM, and confirm at least one camera is operating and functioning normally.

Is one camera operating and functioning normally?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE RELATED COAX CABLE CONNECTIONS

NOTE: Some vehicles are not be equipped with a camera at each location specified below.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. Turn the ignition off.
2. Inspect the CVPM harness connector for a secure and undamaged connection.
3. Inspect the Coax Cable in-line harness connectors for a secure and undamaged connection.
4. Inspect the related Camera harness connector for a secure and undamaged connection.

Are the connections secure and undamaged?

Yes

- Go To [5](#)

No

- Repair the cable connection as needed and check video operation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. CHECK THE CVPM

NOTE: The following test is being used to determine that the CVPM recognizes a known good camera, cable and the related connections.

Central Vision Processing Module (CVPM) Connector Color Coding	
Front Camera	Green

Central Vision Processing Module (CVPM) Connector Color Coding	
Left Camera	Beige
Right Camera	Brown
Rear Camera	Orange
Video Output to Radio / Display	Violet

1. On the vehicle, identify and locate the faulted circuit connector for testing at the CVPM.

NOTE: For example, a fault setting for the Front Camera would indicate the **GREEN** connector at the CVPM.

2. Disconnect the connector at the CVPM for the faulted circuit being set against.
3. On the vehicle, identify and locate a known good operating and functioning camera, circuit and related connector at the CVPM.
4. Disconnect the connector at the CVPM for a known good operating and functioning camera.

NOTE: Continuing with the example, if a fault was setting against the Front Camera; and the Rear Camera is operating and functioning normally on the vehicle - disconnect the Rear Camera connector (**ORANGE** connector) at the CVPM to further test with.

5. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the 9977-6-8-2 test lead to the 9977-6-8-3 test lead.
6. Connect the other end of the 9977-6-8-2 test lead to the CVPM connection for the fault related camera circuit.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-2 test lead would connect to the **GREEN** connector on the CVPM. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

7. Connect the other end of the 9977-6-8-3 test lead to the coaxial cable going to the known good operating and functioning camera.

NOTE: In the example, the **BLUE** connector from the 9977-6-8-3 test lead would connect to the **ORANGE** connector going to the Rear Camera. We are using a known good camera, cable, and connection from the Rear Camera as a substitute for the questionable camera, cable, and connection on the Front Camera.

8. Check the activity status of the camera and fault status.

NOTE: In the example, the status of the Front Camera should show an active image (possibly inverted - due to orientation) of the known good camera circuit being used. The related DTCs for the Front Camera should change to **STORED**. In this example the CVPM would then show no active image and would show **ACTIVE** DTCs set against the Rear Camera with no connection being present.

Did camera activity return and the status of the original setting DTC(s) change to Stored?

Yes

- A known good camera, cable, and connection was used for testing and the CVPM is no longer a possible cause. The camera and cable are the remaining possible causes.

- Go To [6](#)

No

- A known good camera, cable, and connection was used for testing and the CVPM is the only remaining cause.
- Go To [7](#)

6. TEST THE COAX CABLE BETWEEN THE CVPM AND RELATED CAMERA

1. Turn the ignition off.
2. Disconnect the 9977-6-8-2 and the 9977-6-8-3 test leads from the vehicle.
3. Reconnect the known connector for the known good operating and functioning camera circuit used for testing previously.

NOTE: In the example, the Rear Camera connector (ORANGE connector) was disconnected at the CVPM for testing purposes.

4. From the (special tool #9977-6-8, Adapter, RG-174 Coax Cable) kit, connect the long cable (9977-6-8-1) between the related Camera and the CVPM connector.
5. Turn the ignition on.
6. With the scan tool, erase DTCs.
7. Turn the Radio on and wait 25 seconds.
8. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Replace the Camera in accordance with the service information. Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Coax Cable in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CVPM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CVPM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CVPM DTCs.

Did the DTC return?

Yes

- Replace the Central Vision Processing Module (CVPM) in accordance with the Service Information. Refer to **MODULE, CENTRAL VISION PROCESSING (CVPM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0485-00-IMPLAUSIBLE DATA RECEIVED FROM RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

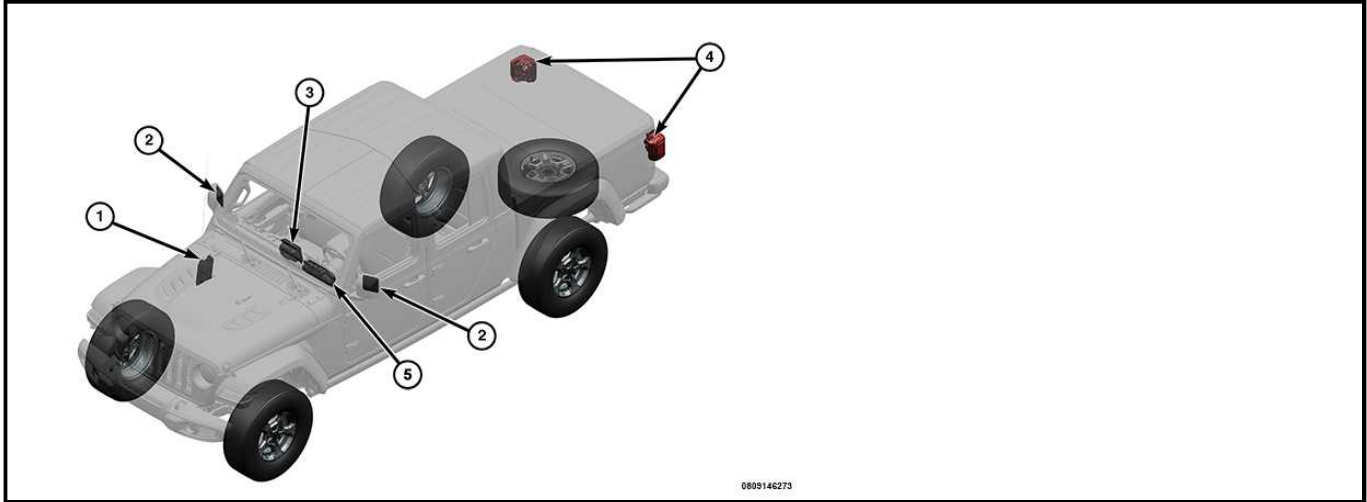
2021 ACCESSORIES AND EQUIPMENT

Chime/Buzzer/Driver Assist (Service Information) - Gladiator

DESCRIPTION AND OPERATION

BLIND SPOT MONITORING

DESCRIPTION



The Blind Spot Monitoring (BSM) with Rear Cross-Path (RCP) detection systems include the following major components:

COMPONENT INDEX

1.	Refer to <u>BODY CONTROL MODULE (BCM).</u>
2.	Refer to <u>EXTERIOR REARVIEW MIRRORS - BLIND SPOT DISPLAY.</u>
3.	Refer to <u>RADIO.</u>
4.	Refer to <u>BLIND SPOT MODULE (BSM) / BLIND SPOT SENSOR (BSS).</u>
5.	Refer to <u>INSTRUMENT PANEL CLUSTER (IPC).</u>

Blind spot monitoring, if enabled in the radio, monitors rear blind zones on both sides of the vehicle via radar. If a vehicle is sensed in one of the blind spot zones, the driver will be notified via an icon in the outside rear view mirror on that side of the vehicle.

Rear cross path detection monitors for vehicles perpendicular to the rear of the vehicle when in reverse. The system provides feedback to the driver via audible chimes and visual icons. The visual and audible alerts correspond to the side that approaching vehicle.

The BSM system:

- Monitors the vehicle's blind spots.
- Notifies the driver when another vehicle is present.
- Uses radar sensors located in the sides of the tail lamps.
- Illuminates icons in the outside review mirrors.
- Chimes when the driver selects a turn signal on the side that has a vehicle in the zone.
- Notifies driver of vehicles in the blind spot areas when changing lanes, passing vehicles, or if being passed.
- RCP detection notifies the driver of a vehicle crossing the vehicle's path when in reverse.
- The driver can turn the system OFF, ON or ON with Chime. (Note: in RCP mode the chime can not be disabled it is always active).

OPERATION

When the vehicle speed exceeds 10 km/h (6 mph) and the Left Blind Spot Sensor (LBSS) or the Right Blind Spot Sensor (RBSS) module detects an object within 50 km/h (30 mph) of the vehicle speed passing through the monitored zone from the rear of the vehicle, the BSM sensors will request a Blind Spot Display (BSD) activation request which is a yellow Light Emitting Diode (LED) triangle will then illuminate in the upper corner of the appropriate mirror through a Pulse Width Modulated (PWM) circuit to the mirror. If the driver attempts to enter the zone where the object has been detected and with the turn signal activated, the sensor will send out two additional requests over the Controller Area Network - Interior High Speed (CAN-IHS) bus:

- Amplifier (AMP) - A chime will sound.
- Radio (if the vehicle is NOT equipped with an AMP) - The audio speakers will mute.

There are three modes for the BSM system:

- OFF: All visual and audible alerts related to objects of interest in the blind sport zone are suppressed.
- ON with LEDs only: The LBSS shall request a visual LED alert only for the appropriate side exterior rearview mirror if there is an object of interest in the blind spot zone.
- ON with LEDs and chime: The LBSS shall request a visual LED and audible alert for the appropriate side mirror if there is an object of interest in the blind spot range and the turn signal status is "ON" on that side of the vehicle. Otherwise, there will be a visual alert only if the turn signal is "Off" and there is an object of interest in the blind spot zone.

Rear Cross Path (RCP) detection system:

- Uses the LED icons on the outside mirrors to warn of vehicles approaching. The alert corresponds to the side that the vehicle is approaching from.
- Is activated when the vehicle is in REVERSE gear and the blind spot system is enabled to ON or ON with Chime in the Radio.

The RCP detection system monitors the rear detection zones for vehicles that are moving toward the sides of the vehicle with a minimum speed of 5 km/h (3 mph).

BLIND SPOT MODULE (BSM) / BLIND SPOT SENSOR (BSS)

BLIND SPOT MODULE (BSM) / BLIND SPOT SENSOR (BSS)

Refer to [**COMPONENT INDEX**](#).

- The BSM system used in this vehicle has two control modules, each internal to the sensor mounted on the inside of the tail lamp assembly. The RBSS is mounted to the backside of the right tail lamp assembly and can be serviced separately from the lamp assembly. The LBSS is mounted to the backside of the left tail lamp assembly and can be serviced separately from the lamp assembly
- Each of the sensors are independent control units.
- Each sensor receives a fused ignition RUN power output.
- Each sensor provides a PWM circuit to its respective side mirror to activate the LED BSD icon.
- Each sensor is also controls the dimming light strategy for the LED BSD icon for each mirror.
- Each sensor activates a bulb-check for approximately 0.6 seconds upon power up for each mirrors LED BSD.
- The LBSS is the master configuration node of the BSM system.
- The LBSS learns the vehicle transmission type through a bus CAN-IHS bus signal gated from the BCM.
- If the sensors are blocked, the LBSS is responsible for sending a signal to the IPC to enable the "Blind Spot Temporarily Unavailable System Blocked" message as well as activating both BSD LED icons in the mirrors.
- The LBSS is responsible for sending the directional chime request for each chime warning event using the signals.

- The detection zone covers a zone approximately one lane on both sides of the vehicle 3.2 meters (10 ft.) and extends from the driver's seat to between 3 and 7 meters (10 ft.) behind the rear fascia depending of the speed of the vehicle.

Inputs

- Fused ignition run/accessory power output
- Vehicle transmission type via the CAN-IHS gated from the BCM
- Transmission gear position signal gated from the BCM

Outputs

- PWM circuit to each sensors respective side mirror to activate the LED BSD icon
- Dimming light strategy for the LED BSD icon for each mirror
- Indication strategy to the IPC to enable the warning indicator
- Directional chime request for each chime warning event

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM performs the gateway function from the CAN-IHS to the CAN-C (Chassis) network.

Outputs

- Vehicle transmission type to the LBSS/RBSS
- Mute request to the radio

EXTERIOR REARVIEW MIRRORS - BLIND SPOT DISPLAY

EXTERIOR REARVIEW MIRRORS - BLIND SPOT DISPLAY

Refer to [COMPONENT INDEX](#).

- Each Blind Spot Display (BSD) located within the exterior rearview mirror is controlled by a hard wired output from the same side LBSS/RBSS.
- Each BSD shares a ground with the turn signal located within the mirror.

The BSM displays provide the vehicle operator with a visual alert that a target vehicle has been detected within one of the BSM or RCP detection zones. The BSM display is also illuminated momentarily as a bulb check each time the ignition switch status transitions to On as a part of the BSM system self tests. If a BSM display remains illuminated with the vehicle in the park or neutral position, it indicates that the BSM system has registered a system fault and may require service. If there is a fault, the mirror indicator opposite from the faulted indicator side will stay illuminated.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [COMPONENT INDEX](#).

- The IPC is responsible for displaying temporary unavailable and service warnings to the customer.

Inputs

- Indication strategy from the LBSS/RBSS to enable the warning indicator

RADIO

RADIO

Refer to [COMPONENT INDEX](#).

The AMP or Radio (if the vehicle is not equipped with an AMP) is responsible for the audible BSM warnings to the customer.

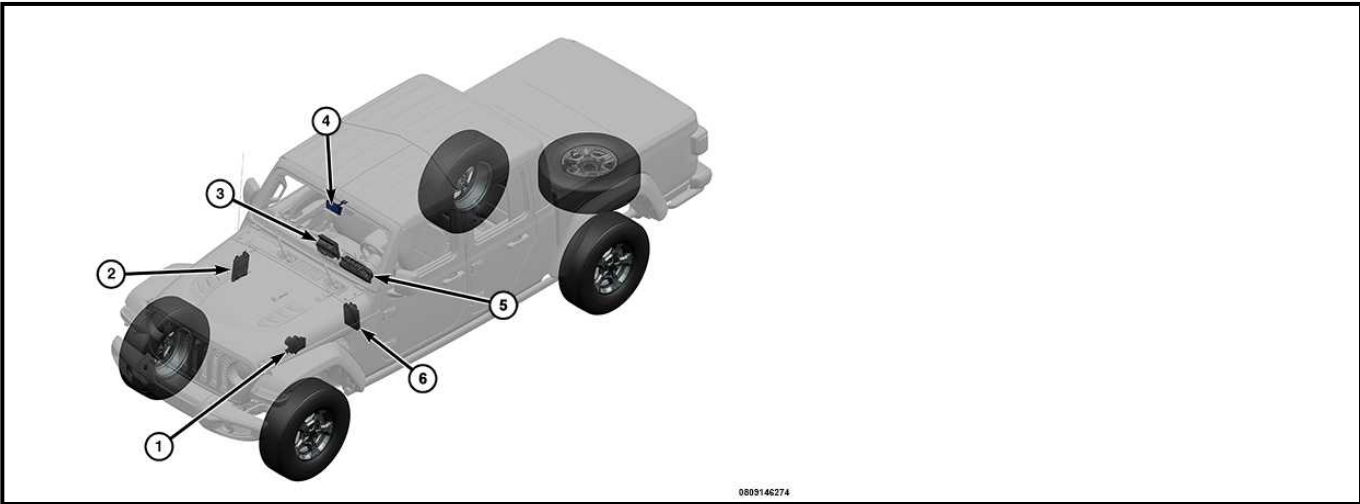
Inputs

- The Radio receives a request from the BCM to mute any audio outputs during alert events

FULL SPEED RANGE FORWARD COLLISION WARNING PLUS

DESCRIPTION

NOTE: The Forward Collision Warning (FCW) system alerts and assists the driver to help avoid or mitigate a collision. If the driver does not respond to any of the audible, visual, and haptic warnings, the impact may not be avoided.



COMPONENT INDEX

1.	Refer to ANTI-LOCK BRAKE SYSTEM (ABS) MODULE .
2.	Refer to BODY CONTROL MODULE (BCM) .
3.	Refer to DISPLAY SCREEN MODULE (DSM) .
4.	Refer to DRIVER ASSISTANCE SYSTEM MODULE (DASM) .
5.	Refer to INSTRUMENT PANEL CLUSTER (IPC) .
6.	Refer to AMPLIFIER (AMP) IF EQUIPPED OR RADIO .

- The FCW system uses a forward looking radar to determine the range and speed of the vehicles and objects in the forward path of the host vehicle and a camera to perform object classification and to determine road lane markings which are integrated into the DASM Electronic Control Unit (ECU).
- The DASM uses the radar and camera fusion data to determine probable collisions with vehicles and objects in the forward path of the host vehicle.
- Based on the sensor fusion algorithm and vehicle dynamic data, the DASM determines a Time To Collision (TTC) between the host vehicle and any target vehicles or objects in its forward path.
- When the TTC becomes too small the FCW system provides the driver with audible and visual warning, brake prefill, a haptic warning in the form of a brake jerk, limited autonomous braking and Advanced Brake Assist (ABA) to attempt to alert the driver and to mitigate a potential frontal collision.
- At low vehicle speeds, in addition to the above mentioned functionality, the FCW system provides full autonomous braking in an attempt to mitigate a frontal collision.

The FCW system uses three levels of warnings:

- A visual warning displayed in the IPC
- An audible warning generated by the radio or amplifier system
- A haptic warning in the form of a brake jerk. A brake jerk is a brake pulse or a momentary application of the brakes

The FCW system has six customer configurations:

- FCW+ Far
- FCW+ Medium
- FCW+ Near
- FCW Far
- FCW Medium
- FCW Near

The FCW system is disabled and enabled via a soft switch located in the radio settings in the safety and driver assistance menu. When the system is disabled by the user or if the system is disabled due to a fault, the FCW **OFF** icon will be displayed in the IPC.

OPERATION

- The FCW system is only active when the status of the ignition position is ON, the transmission is in **D** rive and wheel speed sensors indicate that the vehicle is moving in a forward direction.
- The system can be manually disabled and enabled by the vehicle operator using the soft switch in the radio. The default status of FCW is ON. The system state is kept in memory from one key cycle to the next. If the system is turned OFF, it will remain OFF when the vehicle is restarted. The minimum speed for FCW activation is 3 mph (5 km/h).
- The FCW+ system uses the forward looking DASM to determine the range and speed of the vehicle(s) and objects in the forward path of the host vehicle.
- The FCW+ system uses the DASM to perform object classification and to determine lane markings.
- The FCW+ system uses a sensor fusion algorithm to combine the information detected from the object detection and the lane markings to determine probable collisions with vehicles and objects in the forward path of the host vehicle. The internal camera provides the DASM with object information, lane information and the camera status. The sensor fusion algorithm and logic is contained within the DASM.
- Based on the sensor fusion algorithm and vehicle dynamic data the FCW+ System determines a TTC between the host vehicle and any target vehicles or objects in its forward path.
- The system will react on moving objects. A target is considered a moving object if it has a velocity greater than zero while the system is tracking it.
- The system will react on stopped objects. A target is considered a stopped object if it has a velocity greater than zero, then comes to a stop while the system is tracking it.
- The system will react on stationary objects. A target is considered a stationary object if it has zero velocity the entire time the system is tracking it.
- When the TTC becomes too small the FCW system issues visual, audible and haptic warning(s) to alert the driver of a probable collision.
- The first warning provided by the system will be a combined audible/visual warning to the driver. This audible/visual warning may be activated at the same time the brake prefill is performed.
- After the first warning, if the driver has not responded and the collision is still probable, the system provides a second warning. The second warning is a haptic warning in the form of a brake jerk. The DASM will request a brake jerk by transmitting a request to the ABS module. The ABS module will respond and execute the brake jerk request. The audible/visual warnings will be active during the brake jerk warning.
- After the brake jerk, if the driver still has not responded and the collision is still probable the system will activate autonomous braking. The DASM makes the deceleration requests for autonomous braking by

transmitting the signals to the ABS module. The ABS module will respond to the deceleration request for autonomous braking. The audible and visual warnings will be active during the autonomous braking.

- If an ABS event is active, the DASM will continuously send an autonomous brake request while the ABS event is active. Under this condition, the ABS module will honor the autonomous brake request based on the arbitration strategy defined for multiple requests to the ABS system. Autonomous braking may be requested after, at the same time as, or without a brake jerk request, and the request must be honored by the ABS in this condition.

BRAKE PREFILL OPERATION

- Under normal circumstances, there is space between the pads and rotors to prevent the pads from wearing out prematurely. This space between the pads and rotors increases the response time during any situation which may require emergency braking. The brake prefill prepares the system for braking by moving the pads closer to the rotor to improve braking response time.
- The brake prefill is performed by the ABS module.
- The DASM controls the activation and deactivation of the brake prefill.
- The brake prefill should cause no audible brake noise.
- The brake prefill should cause no vehicle deceleration.
- The brake lights will not be activated during a brake prefill.

ADVANCED BRAKE ASSIST OPERATION

- The ABA feature of FCW will provide additional braking during an emergency braking event if the driver provides insufficient braking for the situation.
- The DASM will make deceleration requests for the advanced brake assist feature by transmitting request signals to the ABS module.
- ABA will be aborted when the driver completely releases the brake pedal.
- If an ABS event is active, the DASM will continuously send an ABA request while the ABS event is active. Under this condition, the ABS module will honor the ABA request based on the arbitration strategy defined for multiple requests to the ABS system.

AUTONOMOUS BRAKE REQUEST OPERATION

- After the brake jerk, if the driver still has not responded and the collision is still probable the system will activate autonomous braking.
- The DASM will make the deceleration requests for autonomous braking by transmitting the signals to the ABS module.
- The ABS system will send a Controller Area Network-Chassis (CAN-C) bus request to the BCM to activate the brake lights.

Since there are multiple modules involved in the operation of the FCW system, all faults or diagnostic trouble codes should be checked during diagnosis. The DASM integrated radar requires proper alignment. Any alignment or configuration issues may cause the system to be inoperative. If the DASM detects incorrect or compromised information, the FCW will function in a limited capacity.

AMPLIFIER (AMP) IF EQUIPPED OR RADIO

AMPLIFIER (AMP) IF EQUIPPED OR RADIO

Refer to **COMPONENT INDEX**.

Used to provide auditory warning chimes to the cabin of the vehicle. The DASM controls the warning logic and uses the BCM to provide a gated message request to the Radio or AMP.

ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Refer to [COMPONENT INDEX](#).

The ABS module provides a variety of vehicle dynamic inputs to the DASM. The DASM uses these inputs to manage the FCW strategy. The DASM will output braking requests to the ABS module for autonomous braking and brake prefill.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM is the gateway for the BUS communication systems. The BCM is also responsible for providing vehicle specific configuration parameters to multiple nodes on the BUS, battery voltage and commanded ignition state signals to the DASM. The BCM receives input signals from the DASM that it gates to the IPC for warning display messages and, under specific conditions, to the Radio or AMP to provide audible chime warnings.

DISPLAY SCREEN MODULE (DSM)

DISPLAY SCREEN MODULE (DSM)

Refer to [COMPONENT INDEX](#).

The DSM provides an interface for the vehicle operator to modify the customer programmable options.

DRIVER ASSISTANCE SYSTEM MODULE (DASM)

DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Refer to [COMPONENT INDEX](#).

The DASM uses an integral radar and camera, by means of data fusion, to detect vehicles in the forward path of the vehicle that are moving, stopped or stationary and lane markings on the road. The DASM considers an object moving if it has a velocity greater than zero while being tracked. The DASM considers an object stopped if it has a velocity greater than zero and then comes to a stop. The DASM will consider an object stationary if it has zero velocity the entire time that it is being tracked.

The DASM controls the activation and deactivation of the visual and audible warning in the IPC. The DASM commanded audible warning used by the FCW system is generated by the radio or amplifier system. All warning signals, visual or auditory, are transmitted to the BCM over the CAN-C bus to be gated to CAN-Interior High Speed (CAN-IHS) and forwarded to the IPC, Radio or AMP.

INSTRUMENT PANEL CLUSTER (IPC)

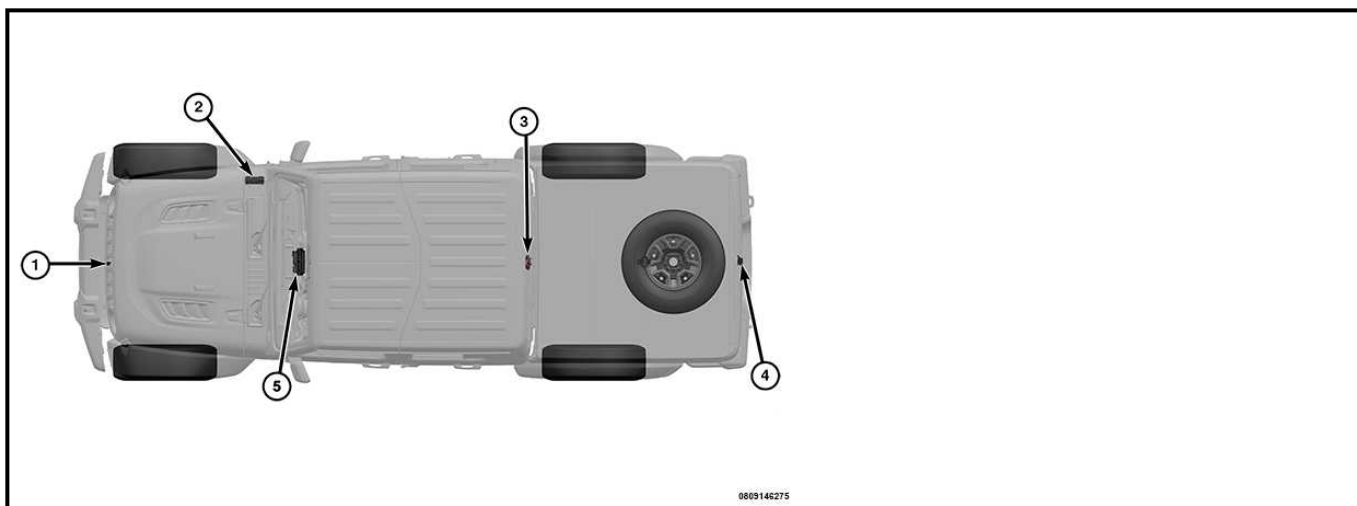
INSTRUMENT PANEL CLUSTER (IPC)

Refer to [COMPONENT INDEX](#).

The IPC receives vehicle specific configuration data and warning message requests gated from the BCM. The command for the warning messages originate with the DASM.

OFF-ROAD CAMERA SYSTEM

DESCRIPTION



The forward and rear view camera system can consist of the following components:

COMPONENT INDEX

1.	Refer to <u>FRONT VIEW CAMERA (FVC).</u>
2.	Refer to <u>BODY CONTROL MODULE (BCM).</u>
3.	Refer to <u>CENTRAL VISION PROCESSING MODULE (CVPM).</u>
4.	Refer to <u>REAR VIEW CAMERA (RVC).</u>
5.	Refer to <u>RADIO.</u>

RVC - The RVC with trailer hitch zoom displays an on-screen mirrored image of the rear surroundings behind the vehicle whenever the gear shift lever is placed into "REVERSE" or "MANUALLY" activated from the radio screen. The system helps the driver judge the relative position and distance to obstacles behind the vehicle. When enabled, customer selectable Static Gridlines with the center line are overlaid on Backup Camera View. When enabled, customer selectable Dynamic Gridlines with the center line are overlaid on Backup Camera View.

FVC - The FVC displays the front image of the vehicle whenever activated from the radio screen. The system helps the driver to get a better view of the front of the vehicle for Off Road activity. When enabled, customer selectable Dynamic Tire Lines are overlaid on FVC view.

The FVC is capable of displaying camera images under the following conditions:

- The driver has enabled the system
- Ignition state is RUN
- Wheel speed signals are detected (any speeds)
- PRND status is detected (any gear)

The driver is able to enable to the FVC or the RVC with display via a touch screen control soft button entry in the radio menu.

Zoom View Requirements

Zoom in P ark - The CVPM receives a Control Area Network - Interior High Speed (CAN-IHS) bus message from the radio indicating the customer selectable zoom option has been requested. The CVPM confirms that the vehicle is in **P** ark based on an input from the BCM and that the vehicle speed does not indicate that the vehicle is in motion. Once these conditions are confirmed, the CVPM switches from backup camera view mode to a backup zoomed view once the Zoom (+) button is pressed on the video camera display. When pressing the (-) button, the CVPM switches from the zoomed view back to the backup camera view.

Zoom in R everse - The CVPM receives a Control Area Network - Interior High Speed (CAN-IHS) bus message from the radio indicating the customer selectable zoom option has been requested. The CVPM confirms that the vehicle is in **R** everse based on an input from the BCM and that the vehicle speed does not

exceed 8 mph. Once these conditions are confirmed, the CVPM switches from backup camera view mode to a backup zoomed view once the Zoom (+) button is pressed on the video camera display. When pressing the (-) button, the CVPM switches from the zoomed view back to the backup camera view.

Zoom in N eutral - The CVPM receives a Control Area Network - Interior High Speed (CAN-IHS) bus message from the radio indicating the customer selectable zoom option has been requested. The CVPM confirms that the vehicle is in **N eutral** based on an input from the BCM and that the vehicle speed does not exceed 8 mph. Once these conditions are confirmed, the CVPM switches from backup camera view mode to a backup zoomed view once the Zoom (+) button is pressed on the video camera display. When pressing the (-) button, the CVPM switches from the zoomed view back to the backup camera view.

Zoom in D rive - The CVPM receives a Control Area Network - Interior High Speed (CAN-IHS) bus message from the radio indicating the customer selectable zoom option has been requested. The CVPM confirms that the vehicle is in **D rive** based on an input from the BCM and that the vehicle speed does not exceed 8 mph. Once these conditions are confirmed, the CVPM switches from backup camera view mode to a backup zoomed view once the Zoom (+) button is pressed on the video camera display. When pressing the (-) button, the CVPM switches from the zoomed view back to the backup camera view.

CVPM Front Camera Washing System - The FVC radio options include a "Clean Camera" soft button that the CVPM will highlight when needed. When this button is pressed, the CVPM activates a timed wash cycle for up to 20 seconds. The FVC has its own washer nozzle and pump connected near to it in order to perform the washing of the lens.

Grid Lines - RVC

- **Dynamic** - When enabled, dynamic grid lines are projected on the ground plane and overlaid on the backup camera view. The center line is overlaid with the dynamic grid line. The dynamic grid lines represent the maximum width of the vehicle plus an additional one inch per side and the projected path of the vehicle based on its direction of travel. These overlaid active dynamic grid lines are enabled/disabled via a touch screen control (soft button) in the personalization entry in the camera settings menu. The dynamic grid lines will not be present or function if the steering angle signal to the CVPM is absent or implausible.
- **Static** - When enabled, static grid lines are projected on the ground plane and overlaid on the backup camera view. The center line is overlaid with the static grid lines. The static grid lines represent the maximum width of the vehicle. The overlaid static grid lines can be enabled/disabled via a touch screen control (soft button) personalization entry in the camera settings menu.

Tire Lines - FVC - When enabled, tire lines are projected on the ground plane and overlaid on the front camera video image. The overlaid tire lines can be enabled/disabled via a touch screen control (soft button) personalization entry in the camera settings menu. The tire lines will not be present or function if the steering angle signal to the CVPM is absent or implausible.

Radio Soft Buttons for Camera Options - When any of the camera soft buttons for display are selected, the radio sends a signal over the bus to the CVPM with the request and awaits a return signal from the CVPM indicating that the display view is active. The radio then displays the proper camera video image.

Indication Strategy

- The CVPM image output resolution is 1024 x 768 pixels and the radio supports an aspect ratio of 4:3.
- The CVPM overlays the following soft buttons on the backup camera view and the backup zoomed view:
 - Backup Camera
 - Zoom
 - FVC
 - Image Defeat
- The CVPM overlays the following soft buttons on the FVC view:
 - FFC

- Backup Camera
- Clean Camera
- Image Defeat
- When the CVPM has incurred a communication error with any camera, the CVPM will blank the image from the faulty camera.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM is responsible for vehicle configuration deployment and gating messages between CAN networks for system operations.

Outputs

- Gated vehicle speed message to the CVPM
- PRND state to the CVPM
- Ignition state to the CVPM
- Steering wheel angle to the CVPM
- Vehicle configuration - vehicle line, Body style, which cameras are equipped, transfer case type, transfer case state, transmission type and transmission gear state to the CVPM
- Global drive mode status to the CVPM
- Steering factor to the CVPM
- Camera wash response to the CVPM

CENTRAL VISION PROCESSING MODULE (CVPM)

CENTRAL VISION PROCESSING MODULE (CVPM)

Refer to [COMPONENT INDEX](#).

The video processing unit or CVPM is capable of generating video views for the FVC off road and RVC backup options. Other functions and operations of the CVPM are:

- The camera system uses multiple cameras to provide situational awareness during maneuvers requiring real-time visual checks of the vehicle's perimeter.
- The camera system provides an automatically selected view with minimal distortion from which it is easy to judge distance and orientation to obstacles in the field of view.
- The camera system views are displayed based on PRND status, vehicle speed and trajectory with more view options available through direct on-screen interaction on the touch screen display.
- When enabled, active dynamic, multicolored gridlines are overlaid on the video image to illustrate the width of the vehicle and its projected path based on the steering wheel angle, wheelbase and direction of travel.

Inputs

- Gated vehicle speed message from the BCM
- PRND state from the BCM
- Ignition state from the BCM
- Steering wheel angle from the BCM
- Vehicle configuration - vehicle line, Body style, which cameras are equipped, transfer case type, transfer case state, transmission type and transmission gear state from the BCM
- Global drive mode status from the BCM

- Steering factor from the BCM
- Camera wash response from the BCM
- FVC and RVC video inputs
- Touch screen request from the Radio
- Commanded touch screen status from the Radio
- Camera display status from the Radio

Outputs

- Grid lines display for FVC and RVC to the radio
- Image defeat request status to the Radio
- LVDS video signal to the Radio
- Camera wash request status

FRONT VIEW CAMERA (FVC)

FRONT VIEW CAMERA (FVC)

Refer to [COMPONENT INDEX](#).

The FVC displays front image of the vehicle whenever activated from the radio screen. The system helps driver to get a better view of the front of the vehicle for Off Road activity. When enabled, customer selectable dynamic tire lines are overlaid on FVC view.

The FVC is capable of displaying camera images under the following conditions:

- The driver has enabled the system
- Ignition state is RUN
- Wheel speed signals are detected (any speeds)
- PRND status is detected (any gear)

RADIO

RADIO

Refer to [COMPONENT INDEX](#).

When any of the camera soft buttons for display are selected in the camera menu option on the radio touch screen, the radio sends a signal over the bus to the CVPM with the request and awaits a return signal from the CVPM indicating that the display view is active. The radio then displays the proper camera video image.

Inputs

- Off road pages request from FVC
- Configuration data from the BCM
- PRNDL display gated from the BCM
- Global drive system from the BCM
- Vehicle speed gated from the BCM
- Commanded ignition state from the BCM
- Transfer case state gated from the BCM
- Transmission state gated from the BCM
- Image defeat request from the Radio
- Internal signals from the soft button on the screen to the Radio

Outputs

- Touch screen status
- Touch screen X and Y axis coordinates
- Off road pages request from FVC
- Radio display request status to the CVPM
- Camera display state to the CVPM

REAR VIEW CAMERA (RVC)

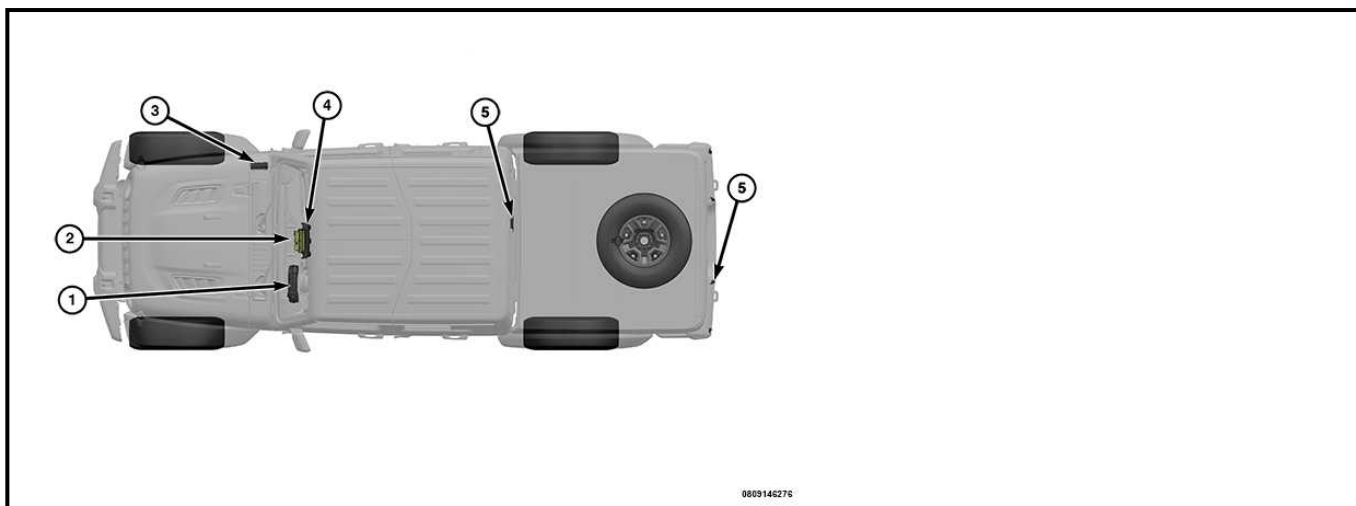
REAR VIEW CAMERA (RVC)

Refer to **COMPONENT INDEX**.

The RVC is the device used for Driver assistance which shows the video image of the area behind the vehicle. Its function is to provide a real time, wide angle video image of the area behind the vehicle and display it to the operator when the vehicle is in reverse, or for a short period of time in any other gear when an activation button is pressed. The RVC also provides the capability for trailer hitch zoom, allowing the operator to see a close up image of the vehicle's hitch during maneuvers involving a trailer.

REAR PARK ASSIST

DESCRIPTION



The Rear Park Assist (RPA) system is comprised of the following components:

COMPONENT INDEX

1.	Refer to INSTRUMENT PANEL CLUSTER (IPC) .
2.	Refer to RADIO .
3.	Refer to BODY CONTROL MODULE (BCM) .
4.	Refer to INTEGRATED CENTER STACK (ICS) .
5.	Refer to PARK ASSIST MODULE (PAM) .
6.	Refer to PARK ASSIST SENSORS (PAS) .

The RPA System detects objects located behind the vehicle within defined coverage zones. When an object is detected, the RPA System provides an alert to the customer based on the selected customer configuration and the object's location and distance relative to the vehicle. The system assists the driver during parking by sensing obstacles situated outside the driver's field of view.

The information regarding the presence and distance of an obstacle is transmitted to the driver in the form of an audible alert through the radio and a graphic display on the IPC. The audible alert is pulsed at a rate dependent on distance to the obstacle.

OPERATION

Each time the park assist OFF switch is depressed the switch bank pod circuitry sends an electronic switch status message input to the BCM over the Controller Area Network - Interior High Speed (CAN-IHS) data bus. The BCM then relays an electronic switch request message to the PAM. The PAM responds to each switch request message by toggling the status of the appropriate Park Assist System (PAS) feature from enabled to disabled, or from disabled to enabled, then sends an electronic system status message back to the BCM over the CAN-IHS data bus as confirmation.

The BCM responds to the system status message by sending a message to the ICS over the CAN data bus to control the park assist Light Emitting Diode (LED) units so that they are illuminated only when appropriate while the status of the ignition is ON, and are extinguished when the status of the ignition is anything except ON. If the PAS is disabled due to a monitored fault or failure, a press of the park assist OFF push button will result in the LED flashing on and off for about 5 seconds, then lighting solid.

OPERATING CONDITIONS

- The PAS is active only when the ignition switch is in the ON or START positions and the transmission (manual or automatic) is in one of the following:

- REVERSE gear position and the vehicle speed is less than 11 km/h (7 mph).
- DRIVE or a forward gear position and the vehicle speed is less than 9 km/h (6 mph) on deceleration.
- DRIVE or a forward gear position and the vehicle speed is less than 11 km/h (7 mph) on acceleration.

The PAS is enabled from the factory as a default but can be disabled or enabled by pressing the defeat switch in the Integrated Center Stack (ICS).

DISABLE FEATURE - When the system is disabled, a **PARK ASSIST OFF** textual message will appear within the IPC display of the instrument cluster whenever the gear selector lever is in the REVERSE position.

When the PAM monitors a problem in any of the PAS circuits or components, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit, sends an electronic message to the IPC, and a **SERVICE PARK ASSIST SYSTEM** textual message is displayed in the IPC display.

When the PAS button is pressed to ON, the ICS sends an output signal to the BCM. The BCM then relays an electronic switch request message to the PAM over the CAN data bus. The PAM responds to each switch request message by toggling the status of the appropriate PAS feature from enabled to disabled, or from disabled to enabled, then sends an electronic system status message back to the BCM over the CAN data bus as confirmation.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM is the gateway for CAN-IHS to CAN-C bus communications.

Inputs

- Receiving the ICS input request for PAS ON/OFF requests
- Reverse gear status input from the Powertrain Control Module (PCM) obtained over the CAN bus from the Transmission Control Module (TCM) if equipped with an automatic transmission or the Neutral Position Sensor (NPS) if equipped with a manual transmission

Outputs

- Enabling and disabling the PAS light
- Outputs the chime activation request
- Requests to the IPC to display the vehicle graphics layout on the IPC screen

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [**COMPONENT INDEX**](#).

The visual warnings are provided in the IPC for when there is an object within 120 cm (47 in) in front of the vehicle or 200 cm (78 in) behind the vehicle. In drive, only the front is active and it is only displayed when the object is detected. In reverse, both the front and rear are active and the screen is requested at all times. The audible warning will change from intermittent beeps to a continuous tone as the vehicle comes to within 30 cm (12 in).

Inputs

- Display activation from the BCM
- Display graphic layouts from the BCM
- Park alerts from the BCM
- Chime activations from the BCM
- PAM system status from the BCM
- Above speed indication from the BCM

Outputs

- PAS display
- PAS Enable/Disable/Unavailable/User Disabled status
- PAM system faults
- Chime activations

INTEGRATED CENTER STACK (ICS)

INTEGRATED CENTER STACK (ICS)

Refer to [**COMPONENT INDEX**](#).

The park assist Off switch is integral to the ICS which is located just below the radio. The switch push button is clearly identified with a white International Control and Display Symbol graphic for Parking Aid and the text OFF. An amber LED unit is illuminated behind a small clear plastic jewel-like lens in the park assist OFF push button to give a visual indication whenever the park assist system has been manually disabled or if a system fault is monitored.

The status of the park assist OFF switch is continually monitored by the circuitry within the ICS. The ICS receives battery voltage at all times on a fused battery feed circuit and has a path to ground at all times through the instrument panel wire harness. The inputs to and outputs from the ICS consist of electronic message communication with the BCM over the CAN data bus.

Inputs

- Receives the semi-automatic park and park assist lighting requests from the PAS switch
- Receives the PAM lighting control inputs from the BCM

Outputs

- Sends the PAM switch status On/Off requests to the BCM
- Sends the semi-automatic park and park assist lighting command to the PAS switch.

PARK ASSIST MODULE (PAM)

PARK ASSIST MODULE (PAM)

Refer to [COMPONENT INDEX](#).

The PAM is the central component of the PAS. It supplies voltage to the park assist sensors, receives and analyzes data from the sensors, calculates and communicates the proper display information to the BCM, performs system diagnostics, and communicates with other electronic modules in the vehicle over the CAN data bus. The module operates on battery voltage received through a fuse in the Power Distribution Center (PDC), and is grounded through a take out of the body wire harness.

Inputs

- Each park assist sensor inputs to the PAM
- PAM operation mode from the BCM
- Ignition status from the BCM
- Vehicle speed from the Anti-lock Brake System (ABS) module
- Reverse gear status from the BCM
- PAM alert mode from the BCM

Outputs

- Power to each park assist sensors
- PAM LED control status to the BCM
- Park chime type to the BCM
- Park chime activation to the BCM
- Park chime repetition rate to the BCM
- PAM system fault to the BCM
- PAM above speed to the BCM
- Trigger signals to all of the park assist sensors

PARK ASSIST SENSORS (PAS)

PARK ASSIST SENSORS (PAS)

Refer to [COMPONENT INDEX](#).

Ultrasonic park assist sensors located in the rear bumper fascia allow the PAS to locate and identify the proximity of nearby obstacles. The sensors each receive battery current and ground in parallel from the PAM, but are each connected to individual dedicated serial bus communication circuits to the PAM. These sensors each generate ultrasonic sound pulses when triggered by the PAM, then signal the PAM when an echo of the reflected sound pulses is received. The detection distance range from the rear of the vehicle is about 200 cm (78 in), and the detection range for the front of the vehicle is within 120 cm (47 in). The detection area extends around the rear corners of the vehicle.

Inputs

- Receives power from the PAM
- Receives ground from the PAM

Outputs

- Outputs the ultrasonic signal to the PAM

RADIO

RADIO

Refer to **COMPONENT INDEX**.

The Radio displays a personalization menu entry that will allow the customer to set the RPA chime volume. When the Radio wakes up on CAN-IHS, the Radio recalls the state of the RPA chime volume feature.

When the customer selects a RPA chime volume setting, the Radio sends a configuration signal to the PAM. When the PAM receives a request for the RPA chime volume feature, the PAM changes the setting and responds back to the Radio with the new volume level request. When the Radio receives this request, the Radio changes the stored status of the RPA chime volume setting and changes the display to the customer.

DIAGNOSIS AND TESTING

BLIND SPOT MONITOR SYSTEM

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The following textual messages related to the Blind Spot Monitor (BSM) system may appear within the display of the Instrument Panel Cluster (IPC):

- **BLIND SPOT SYSTEM OFF** - This message to the vehicle operator when the ignition first transitions to the ON status indicates that the BSM system has been turned off using the Setup Menu of the Radio.
- **SERVICE BLIND SPOT SYSTEM** - This message to the vehicle operator while the ignition status is ON indicates that the BSM system is unavailable due to a monitored system fault or faults.
- **BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE** - This message to the vehicle operator while the ignition status is ON indicates that the BSM system is temporarily unavailable as a result of one of the following:
 1. **Sensor Blockage** - The amber BSM visual icon in both outside rear view mirrors will be illuminated as long as blockage exists or until the ignition status transitions to OFF, whichever occurs first. Remove debris from fascia outer, inner and around the BSM bracket before retesting.
 2. **Monitored System Fault** - The BSM system has detected a monitored system fault condition with some other module in the vehicle that the blind spot receives signals from or relies on to function and has stored a Diagnostic Trouble Code (DTC). The amber BSM visual icon will be illuminated in both outside rear view mirrors for as long as the condition exists or until the ignition status transitions to OFF, whichever occurs first.

BLIND SPOT SYSTEM DOES NOT OPERATE AFTER DOOR IS REMOVED AND INSTALLED - If the BSM system does not activate and no DTCs are found in the system, check the door wiring connector and connector pin integrity. A damaged pin can create a voltage condition that will not allow the BSM to operate.

NOTE:

If the **BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE** message is received for a minimum of 5 minutes, please verify that sensor enclosures on the sides of the tail lamps where the radar sensors are located is not blocked by snow, ice or road debris. If the area is blocked, remove the blockage and cycle the Ignition.

NOTE:

If the vehicle has experienced any trauma in the sensor enclosures on the sides of the tail lamps where the sensors are located, even if the fascia is not

damaged, the radar sensor may have become misaligned. A misaligned radar sensor will result in the BSM system not operating properly.

For DTC diagnostics for the left side BSM or. Refer to [**DIAGNOSIS AND TESTING**](#) . for the right side BSM. Refer to [**DIAGNOSIS AND TESTING**](#) .

DIAGNOSIS AND TESTING - PARK ASSIST SYSTEM

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

A Park Assist warning icon or textual message may appear within the Instrument Panel Clusters (IPC). If a warning appears on the IPC and the condition is related to the Park Assist system; be certain to confirm the following:

- Be certain that the fascia is free of dirt and debris to keep the system operating properly. The Park Assist system is self correcting, verify that the area of the fascia where the sensors are located (both the face and the back) is not blocked by ice, snow, mud or other obstructions. If the area is blocked, remove the blockage, shift the transmission selector lever into **R** everse and verify the warning is no longer present on the IPC display.
- Be certain that the parking brake is not applied.
- The presence of operating heavy construction equipment, large trucks and other vibrations in the vicinity of the vehicle could impact the performance of the Park Assist system.
- Verify the park assist sensors are properly seated. A loose sensor can prompt a warning to wipe the sensor or a warning that the sensors are blocked. This condition may not set a Diagnostic Trouble Code (DTC).

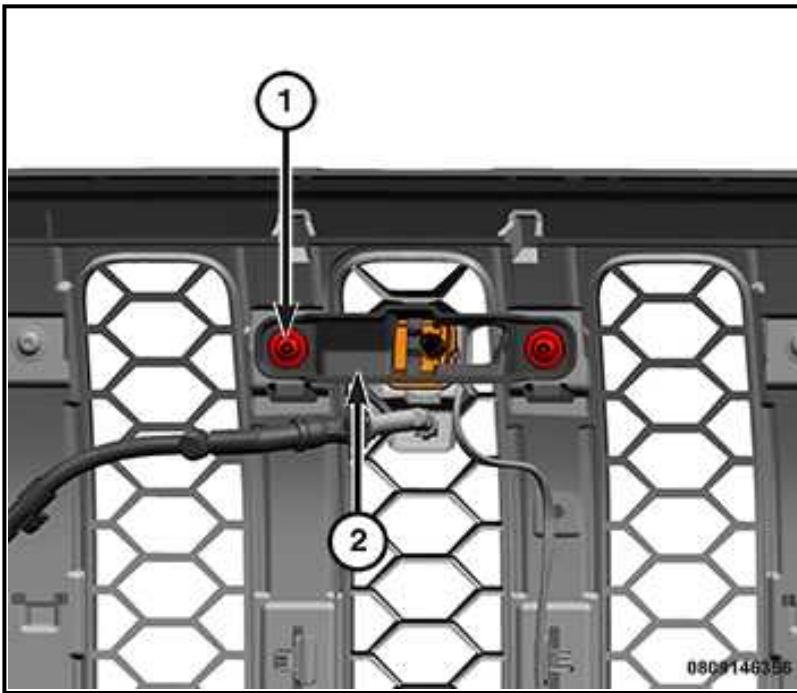
CAMERA

REMOVAL AND INSTALLATION

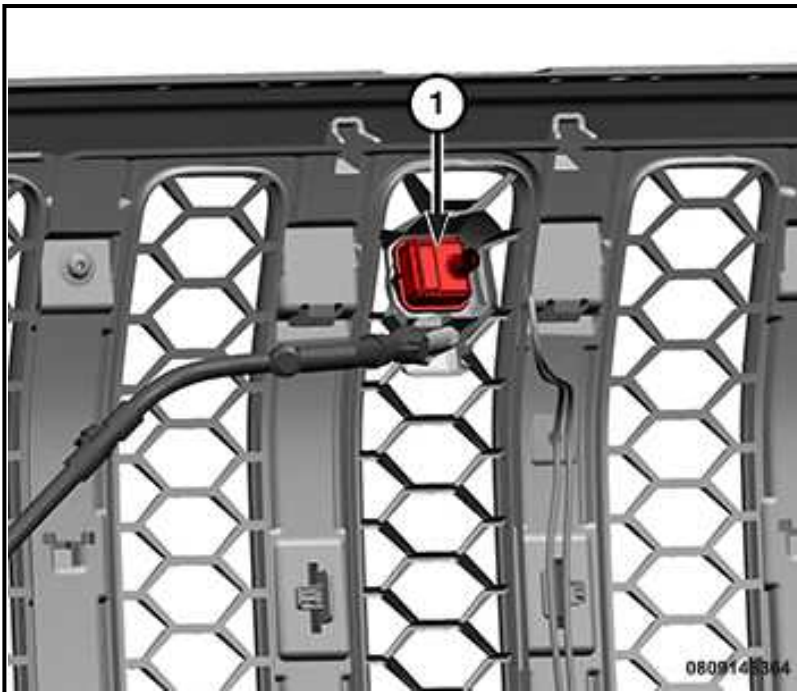
FRONT

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the front grill assembly. Refer to [**GRILLE, REMOVAL AND INSTALLATION**](#) .
3. Disconnect the wire harness connector for the Front View Camera (FVC).



4. Remove the two fasteners (1) securing the FVC retaining bracket (2).



5. Remove the FVC (1) from the vehicle grill.

INSTALLATION

1. Install the FVC into the grill.
2. Install the FVC bracket and the two fasteners and securely tighten.
3. Connect the wiring harness connector to the FVC.
4. Install the front grill assembly. Refer to [GRILLE, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

REAR

The Rear View Camera (RVC), when equipped with a Front View Camera (FVC), is removed and installed the same as the RVC without FVC. For removal and installation of the RVC, Refer to [CAMERA, REAR, REMOVAL AND INSTALLATION](#) .

DISPLAY, BLIND SPOT

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The Blind Spot Monitor (BSM) display Light Emitting Diode (LED) indicator and icon are integral to the outside rear view mirror glass and case unit. Refer to **MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION** **MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION** .

MODULE, PARK ASSIST

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

For removal and installation of the Park Assist Module (PAM). Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .

SENSOR, BLIND SPOT

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The optional Blind Spot Monitor (BSM) system used in this vehicle has two control modules, each internal to the sensor mounted on the inside of the tail lamp assembly. The Right Blind Spot Sensor (RBSS) is mounted to the backside of the right tail lamp assembly and can be serviced separately from the lamp assembly. The Left Blind Spot Sensor (LBSS) is mounted to the backside of the left tail lamp assembly and can be serviced separately from the lamp assembly. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .

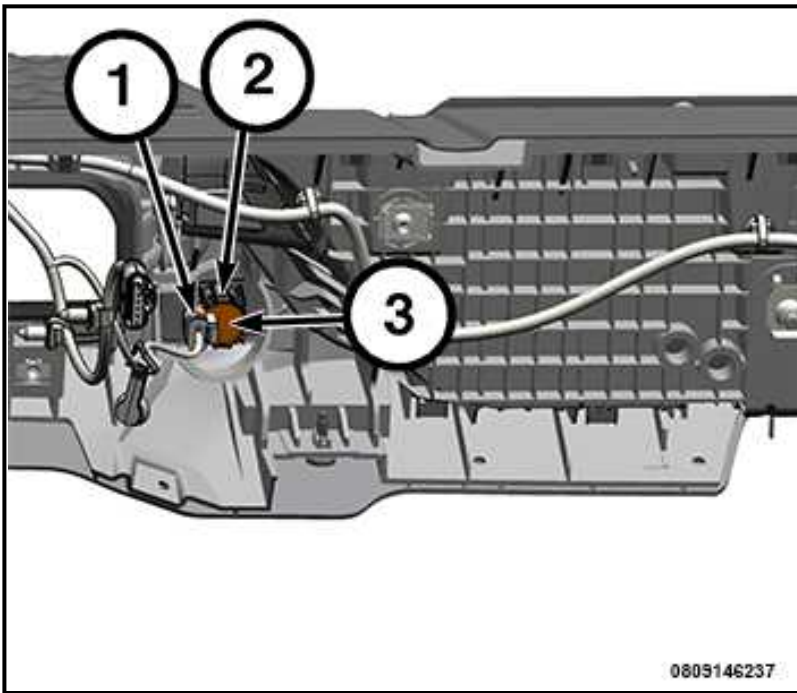
SENSOR, PARK ASSIST

REMOVAL AND INSTALLATION

REAR CENTER

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
3. Remove the rear bumper. Refer to **BUMPER, REAR, REMOVAL AND INSTALLATION** .
4. Disconnect the Park Assist Sensor harness connector (1).



5. Carefully pry the park assist sensor bracket latch features (2) away from the latch tabs of the park assist sensor (3) far enough to disengage the sensor from the bracket.
6. Disengage the resilient O-ring spacer from around the circumference of the sensor membrane protrusion and remove the sensor.

INSTALLATION

1. Position the park assist sensor to engage the O-ring spacer (also known as the decoupling ring) around the circumference of the park assist sensor membrane protrusion.

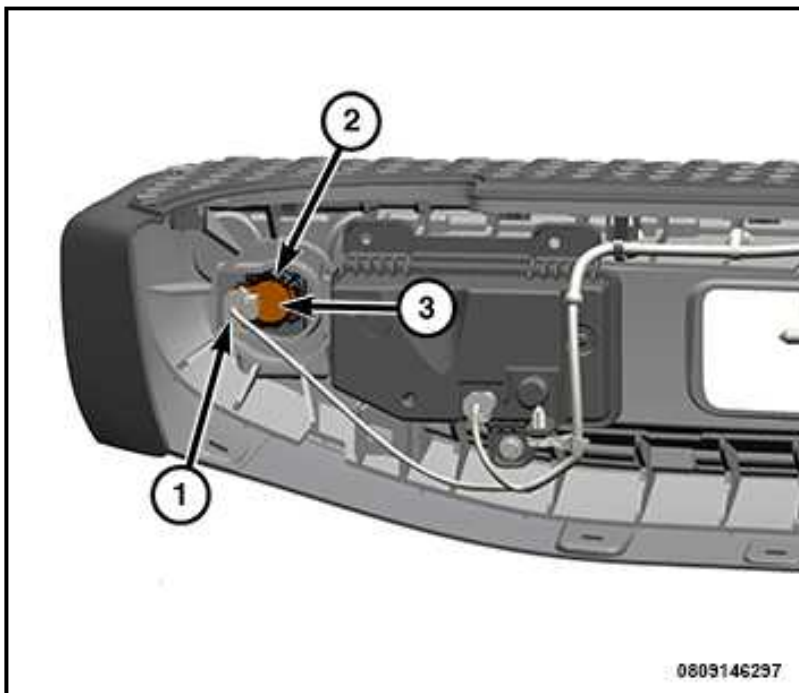
NOTE: Production and all service replacement O-ring spacers are tapered. The wide side (base) of the O-ring should be seated against the sensor housing and the narrow side should be oriented toward the outer surface of the sensor membrane and the rear fascia.

2. Align and insert the park assist sensor into the sensor bracket until the bracket latch features are fully engaged over the latch tabs of the park assist sensor.
3. Connect the wire harness connector to the park assist sensor connector receptacle.
4. Install the rear bumper. Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#) .
5. Remove the supports and lower the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .
6. Connect the negative battery cable(s). Refer to the appropriate service information .

REAR OUTBOARD

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .
3. Remove the rear bumper. Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#) .



4. Disconnect the Park Assist Sensor harness connector (1).
5. Carefully pry the park assist sensor bracket latch features (2) away from the latch tabs of the park assist sensor (3) far enough to disengage the sensor from the bracket.
6. Disengage the resilient O-ring spacer from around the circumference of the sensor membrane protrusion and remove the park assist sensor.

INSTALLATION

1. Position the park assist sensor to engage the O-ring spacer (also known as the decoupling ring) around the circumference of the park assist sensor membrane protrusion.

NOTE: **Production and all service replacement O-ring spacers are tapered. The wide side (base) of the O-ring should be seated against the sensor housing and the narrow side should be oriented toward the outer surface of the sensor membrane and the rear fascia.**

2. Connect the wire harness connector to the park assist sensor.
 3. Install the rear bumper. Refer to [**BUMPER, REAR, REMOVAL AND INSTALLATION**](#) .
 4. Remove the supports and lower the vehicle. Refer to [**HOISTING, STANDARD PROCEDURE**](#) .
 5. Connect the negative battery cable(s). Refer to the appropriate service information .
-

2021 ACCESSORIES AND EQUIPMENT

(Comfort Seats and Wheel Module (CSWM) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B10C4-11</u>	HEATED STEERING WHEEL CONTROL-CIRCUIT SHORT TO GROUND
<u>B10C4-12</u>	HEATED STEERING WHEEL CONTROL-CIRCUIT SHORT TO BATTERY
<u>B10C4-13</u>	HEATED STEERING WHEEL CONTROL-CIRCUIT OPEN
<u>B10C4-19</u>	HEATED STEERING WHEEL CONTROL-OVERCURRENT
<u>B10C4-4B</u>	HEATED STEERING WHEEL CONTROL-OVER TEMPERATURE
<u>B11C1-13</u>	STEERING WHEEL HEATER POWER SUPPLY CIRCUIT-CIRCUIT OPEN
<u>B1E99-11</u>	FRONT LEFT HEATER CONTROL 1-CIRCUIT SHORT TO GROUND
<u>B1E99-12</u>	FRONT LEFT HEATER CONTROL 1-CIRCUIT SHORT TO BATTERY
<u>B1E99-13</u>	FRONT LEFT HEATER CONTROL 1-CIRCUIT OPEN
<u>B1E99-4B</u>	FRONT LEFT HEATER CONTROL 1-OVER TEMPERATURE
<u>B1E99-92</u>	FRONT LEFT HEATER CONTROL 1-PERFORMANCE OR INCORRECT OPERATION
<u>B1E9A-11</u>	FRONT RIGHT HEATER CONTROL 1-CIRCUIT SHORT TO GROUND
<u>B1E9A-12</u>	FRONT RIGHT HEATER CONTROL 1-CIRCUIT SHORT TO BATTERY
<u>B1E9A-13</u>	FRONT RIGHT HEATER CONTROL 1-CIRCUIT OPEN
<u>B1E9A-4B</u>	FRONT RIGHT HEATER CONTROL 1-OVER TEMPERATURE
<u>B1E9A-92</u>	FRONT RIGHT HEATER CONTROL 1-PERFORMANCE OR INCORRECT OPERATION
<u>B1EB1-1A</u>	FRONT LEFT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1EB1-1B</u>	FRONT LEFT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE ABOVE THRESHOLD
<u>B1EB2-1A</u>	FRONT RIGHT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1EB2-1B</u>	FRONT RIGHT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE ABOVE THRESHOLD
<u>B1F10-11</u>	FRONT LEFT HEATER CONTROL 2-CIRCUIT SHORT TO GROUND
<u>B1F10-12</u>	FRONT LEFT HEATER CONTROL 2-CIRCUIT SHORT TO BATTERY
<u>B1F10-13</u>	FRONT LEFT HEATER CONTROL 2-CIRCUIT OPEN
<u>B1F10-4B</u>	FRONT LEFT HEATER CONTROL 2-OVER TEMPERATURE
<u>B1F10-92</u>	FRONT LEFT HEATER CONTROL 2-PERFORMANCE OR INCORRECT OPERATION
<u>B1F11-11</u>	FRONT RIGHT HEATER CONTROL 2-CIRCUIT SHORT TO GROUND
<u>B1F11-12</u>	FRONT RIGHT HEATER CONTROL 2-CIRCUIT SHORT TO BATTERY
<u>B1F11-13</u>	FRONT RIGHT HEATER CONTROL 2-CIRCUIT OPEN
<u>B1F11-4B</u>	FRONT RIGHT HEATER CONTROL 2-OVER TEMPERATURE
<u>B1F11-92</u>	FRONT RIGHT HEATER CONTROL 2-PERFORMANCE OR INCORRECT OPERATION
<u>B1F16-1A</u>	FRONT LEFT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE BELOW THRESHOLD
<u>B1F16-1B</u>	FRONT LEFT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE ABOVE THRESHOLD
<u>B1F17-1A</u>	FRONT RIGHT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE BELOW

DTC	Description
	THRESHOLD
<u>B1F17-1B</u>	FRONT RIGHT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE ABOVE THRESHOLD
<u>B2199-16</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B2199-17</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B21DD-84</u>	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
<u>B21DD-85</u>	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
<u>B2204-00</u>	ECU CONFIGURATION MISMATCH
<u>B227E-00</u>	ECU OVER TEMPERATURE
<u>B22A9-00</u>	ECU INTERNAL PERFORMANCE
<u>B2353-13</u>	RIGHT HEATED SEATS POWER SUPPLY-CIRCUIT OPEN
<u>U0011-00</u>	CAN INTERIOR BUS OFF PERFORMANCE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0184-00</u>	LOST COMMUNICATION WITH RADIO
<u>U11B8-00</u>	U11B8-00 LOST COMMUNICATION WITH INTEGRATED CENTER STACK (ICS)
<u>U1446-00</u>	IMPLAUSIBLE HEATED STEERING WHEEL TEMPERATURE MESSAGE RECEIVED

DIAGNOSIS AND TESTING

B10C4-11-HEATED STEERING WHEEL CONTROL-CIRCUIT SHORT TO GROUND

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

To control the temperature of the Heated Steering Wheel (HSW), the Comfort Seat and Wheel Module (CSWM) provides power and return circuits to the HSW, using a Pulse Width Modulation (PWM) signal to control current to the heating element.

To monitor the temperature of the heating element, the HSW uses an internal Negative Temperature Coefficient (NTC) type thermistor, which is connected to the left Steering Wheel Switch (SWS). The SWS sends the temperature over a LIN bus circuit to the Steering Column Control Module (SCCM), which then sends the temperature to the CSWM over the CAN-IHS data bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- With the Heated Steering Wheel Turned ON:
 - Module detects a short to ground on the Heated Steering Wheel Feed circuit for more than 2 seconds.
- With the Heated Steering Wheel Turned OFF:
 - Module detects a short to ground on the Heated Steering Wheel Return circuit for more than 2 seconds.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
HEATED STEERING WHEEL FEED CIRCUIT SHORTED TO GROUND
HEATED STEERING WHEEL RETURN CIRCUIT SHORTED TO GROUND
HEATED STEERING WHEEL FEED CIRCUIT SHORTED TO THE HEATED STEERING WHEEL RETURN CIRCUIT
HEATED STEERING WHEEL (HSW)
STEERING COLUMN CONTROL MODULE (SCCM)
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read the CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE RESISTANCE BETWEEN GROUND AND THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS AT THE CSWM C4 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the CSWM C4 harness connector.
3. Check for continuity between ground and the (C91) Heated Steering Wheel Feed circuit at the CSWM C4 harness connector.
4. Check for continuity between ground and the (C986) Heated Steering Wheel Return circuit at the CSWM C4 harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuits being tested.

Is there continuity between ground and either circuit being tested?

Yes

- Go To [3](#)

No

- Go To [6](#)

3. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR A SHORT TO GROUND BETWEEN THE CSWM C4 HARNESS CONNECTOR AND THE SCCM C1 HARNESS CONNECTOR

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove the Driver Airbag in accordance with the Service Information. Refer to [AIR BAG, DRIVER, REMOVAL AND INSTALLATION](#) .
2. Disconnect the SCCM C1 harness connector.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

3. Turn the ignition off.
4. Check for continuity between ground and the (C91) Heated Steering Wheel Feed circuit at the SCCM C1 harness connector.
5. Check for continuity between ground and the (C986) Heated Steering Wheel Return circuit at the SCCM C1 harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuits being tested.

Is there continuity between ground and either circuit being tested?

Yes

- Repair the circuit(s) for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR A SHORT TO GROUND WITHIN THE SCCM

1. Disconnect the SCCM C4 harness connector.
2. Check for continuity between ground and the (C91) Heated Steering Wheel Feed circuit at either SCCM component connector.

3. Check for continuity between ground and the (C986) Heated Steering Wheel Return circuit at either SCCM component connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) connector, always use an appropriate probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuits being tested.

Is there continuity between ground and either circuit being tested?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR A SHORT TO GROUND BETWEEN THE SCCM C4 HARNESS CONNECTOR AND THE HSW HARNESS CONNECTOR

1. Disconnect the HSW harness connector.
2. Check for continuity between ground and the (C91) Heated Steering Wheel Feed circuit at the HSW harness connector.
3. Check for continuity between ground and the (C986) Heated Steering Wheel Return circuit at the HSW harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) connector, always use an appropriate probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuits being tested.

Is there continuity between ground and either circuit being tested?

Yes

- Repair the circuit(s) for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Replace the Heated Steering Wheel (HSW) in accordance with the Service Information. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

6. CHECK FOR A SHORT BETWEEN THE (C91) HEATED STEERING WHEEL FEED CIRCUIT AND (C986) HEATED STEERING WHEEL RETURN CIRCUIT AT HSW HARNESS CONNECTOR

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in

possible serious or fatal injury.

1. Remove the Driver Airbag in accordance with the Service Information. Refer to [AIR BAG, DRIVER, REMOVAL AND INSTALLATION](#) .
2. Disconnect the HSW harness connector.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

3. Turn the ignition off.
4. Check for continuity between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit at the HSW harness connector.

Is there continuity between the circuits being tested?

Yes

- Repair the short between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit. Use the appropriate wiring diagram as a guide to follow the path of the circuit.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK FOR A SHORT BETWEEN THE (C91) HEATED STEERING WHEEL FEED CIRCUIT AND (C986) HEATED STEERING WHEEL RETURN CIRCUIT WITHIN THE HSW

1. The ignition must be off when checking the continuity of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Measure the resistance between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit at the HSW component connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance 1.45 Ohms B $\pm$ 10%?

Yes

- Go To [8](#)

No

- Replace the Heated Steering Wheel (HSW) in accordance with the Service Information. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.

5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for a minimum of 10 seconds.
11. Start the engine.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B10C4-12-HEATED STEERING WHEEL CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

To control the temperature of the Heated Steering Wheel (HSW), the Comfort Seat and Wheel Module (CSWM) provides power and return circuits to the HSW, using a Pulse Width Modulation (PWM) signal to control current to the heating element.

To monitor the temperature of the heating element, the HSW uses an internal Negative Temperature Coefficient (NTC) type thermistor, which is connected to the left Steering Wheel Switch (SWS). The SWS sends the temperature over a LIN bus circuit to the Steering Column Control Module (SCCM), which then sends the temperature to the CSWM over the CAN-IHS data bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Steering Wheel is turned off.

SET CONDITION

- Module detects that the Heated Steering Wheel output voltage is above 5.0 volts for more than 2 seconds when the Heated Steering Wheel is turned off.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
HEATED STEERING WHEEL FEED CIRCUIT SHORTED TO VOLTAGE
HEATED STEERING WHEEL RETURN CIRCUIT SHORTED TO VOLTAGE
HEATED STEERING WHEEL (HSW)
STEERING COLUMN CONTROL MODULE (SCCM)
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: **The Heated Steering Wheel must be turned off when checking for this short to voltage DTC.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE VOLTAGE OF THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS AT THE CSWM C4 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the CSWM C4 harness connector.
3. Start the engine.
4. Measure the voltage of the (C91) Heated Steering Wheel Feed circuit at the CSWM C4 harness connector.
5. Measure the voltage of the (C986) Heated Steering Wheel Return circuit at the CSWM C4 harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) connector, always use an appropriate probing tool to prevent any possible damage to the ECU terminals.

Is there voltage present on either circuit?

Yes

- Go To [3](#)

No

- Go To [6](#)

3. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR A SHORT TO VOLTAGE BETWEEN THE CSWM C4 HARNESS CONNECTOR AND THE SCCM C1 HARNESS CONNECTOR

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove the Driver Airbag in accordance with the Service Information. Refer to [AIR BAG, DRIVER, REMOVAL AND INSTALLATION](#).
2. Disconnect the SCCM C1 harness connector.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

3. Start the engine.
4. Measure the voltage of the (C91) Heated Steering Wheel Feed circuit at the SCCM C1 harness connector.
5. Measure the voltage of the (C986) Heated Steering Wheel Return circuit at the SCCM C1 harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) connector, always use an appropriate probing tool to prevent any

possible damage to the ECU terminals.

Is there voltage present on either circuit?

Yes

- Repair the circuit(s) for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR A SHORT TO VOLTAGE WITHIN THE SCCM

1. Turn the ignition off.
2. Disconnect the SCCM C4 harness connector.
3. Start the engine.
4. Measure the voltage of the (C91) Heated Steering Wheel Feed circuit at either SCCM component connector.
5. Measure the voltage of the (C986) Heated Steering Wheel Return circuit at either SCCM component connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) connector, always use an appropriate probing tool to prevent any possible damage to the ECU terminals.

Is there voltage present on either circuit?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR A SHORT TO VOLTAGE BETWEEN THE SCCM C4 HARNESS CONNECTOR AND THE HSW HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the HSW harness connector.
3. Start the engine.
4. Measure the voltage of the (C91) Heated Steering Wheel Feed circuit at the HSW harness connector.
5. Measure the voltage of the (C986) Heated Steering Wheel Return circuit at the HSW harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) connector, always use an appropriate probing tool to prevent any possible damage to the ECU terminals.

Is there voltage present on either circuit?

Yes

- Repair the circuit(s) for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Heated Steering Wheel (HSW) in accordance with the Service Information. Refer to **WHEEL, STEERING, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for a minimum of 10 seconds.
11. Start the Engine.
12. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
13. With the scan tool, read CSWM DTCs.

NOTE: **The HSW must be turned off when checking for this short to voltage DTC.**

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM)**,

REMOVAL AND INSTALLATION

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B10C4-13-HEATED STEERING WHEEL CONTROL-CIRCUIT OPEN

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, refer to the appropriate wiring information.

THEORY OF OPERATION

To control the temperature of the Heated Steering Wheel (HSW), the Comfort Seat and Wheel Module (CSWM) provides power and return circuits to the HSW, using a Pulse Width Modulation (PWM) signal to control current to the heating element.

To monitor the temperature of the heating element, the HSW uses an internal Negative Temperature Coefficient (NTC) type thermistor, which is connected to the left Steering Wheel Switch (SWS). The SWS sends the temperature over a LIN bus circuit to the Steering Column Control Module (SCCM), which then sends the temperature to the CSWM over the CAN-IHS data bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Steering Wheel is turned on.

SET CONDITION

- Module detects the Heated Steering Wheel Feed circuit current level is below its threshold for more than 2 seconds.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
HEATED STEERING WHEEL FEED CIRCUIT OPEN
HEATED STEERING WHEEL RETURN CIRCUIT OPEN
HEATED STEERING WHEEL (HSW)
STEERING COLUMN CONTROL MODULE (SCCM)
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Start the engine.
6. Turn the Heated Steering Wheel (HSW) on.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR AN OPEN BETWEEN CSWM C4 HARNESS CONNECTOR AND THE SCCM C1 HARNESS CONNECTOR

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove the Driver Airbag in accordance with the Service Information. Refer to [AIR BAG, DRIVER, REMOVAL AND INSTALLATION](#).
2. Isolate the circuits by disconnecting the CSWM C4 harness connector and the SCCM C1 harness connector.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

3. The ignition must be off when checking the continuity of a circuit.
4. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
5. Measure the resistance of the (C91) Heated Steering Wheel Feed circuit between the CSWM C4 harness connector and the SCCM C1 harness connector.
6. Measure the resistance of the (C986) Heated Steering Wheel Return circuit between the CSWM C4 harness connector and the SCCM C1 harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance above 3.0 Ohms for either circuit?

Yes

- Repair the circuit(s) above 3.0 Ohms for an open.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR AN OPEN WITHIN THE SCCM

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuits by disconnecting the SCCM C4 harness connector.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Measure the resistance of the (C91) Heated Steering Wheel Feed circuit between the SCCM C1 component connector and the SCCM C4 component connector.
5. Measure the resistance of the (C986) Heated Steering Wheel Return circuit between the SCCM C1 component connector and the SCCM C4 component connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance above 3.0 Ohms for either circuit?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUIT WIRING AND CONNECTORS BETWEEN THE SCCM AND THE HSW

1. Thoroughly inspect the wiring harness and connectors between the SCCM C4 harness connector and the HSW harness connector.
2. Look for chafed, pierced, pinched, or partially broken wires.
3. Check for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE (C91) HEATED STEERING WHEEL FEED AND (C986) RETURN CIRCUITS FOR AN OPEN WITHIN THE HSW

1. The ignition must be off when checking the continuity of a circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.

3. Measure the resistance between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit at the SCCM C4 harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance 1.45 Ohms B $\pm$ 10%?

Yes

- Go To [6](#)

No

- Replace the Heated Steering Wheel (HSW) in accordance with the Service Information. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for a minimum of 10 seconds.
11. Start the engine.
12. Turn the HSW on.
13. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B10C4-19-HEATED STEERING WHEEL CONTROL-OVERCURRENT

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

To control the temperature of the Heated Steering Wheel (HSW), the Comfort Seat and Wheel Module (CSWM) provides power and return circuits to the HSW, using a Pulse Width Modulation (PWM) signal to control current to the heating element.

To monitor the temperature of the heating element, the HSW uses an internal Negative Temperature Coefficient (NTC) type thermistor, which is connected to the left Steering Wheel Switch (SWS). The SWS sends the temperature over a LIN bus circuit to the Steering Column Control Module (SCCM), which then sends the temperature to the CSWM over the CAN-IHS data bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Steering Wheel is turned on.

SET CONDITION

- Module detects Heated Steering Wheel current above 9.6 amps for more than 2 seconds.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
HEATED STEERING WHEEL FEED CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED
HEATED STEERING WHEEL RETURN CIRCUIT OPEN, HIGH RESISTANCE OR SHORTED
HEATED STEERING WHEEL FEED CIRCUIT SHORTED TO THE HEATED STEERING WHEEL RETURN CIRCUIT
HEATED STEERING WHEEL (HSW)
STEERING COLUMN CONTROL MODULE (SCCM)
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Heated Steering Wheel (HSW) on.
7. With the scan tool, read the CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **[TESTING FOR AN INTERMITTENT CONDITION](#)**.

2. CHECK THE HEATED STEERING WHEEL CIRCUIT RESISTANCE AT THE COMFORT SEAT WHEEL MODULE (CSWM) C4 HARNESS CONNECTOR

1. Turn the ignition off for a minimum of 10.0 seconds.
2. Disconnect the CSWM C4 harness connector.
3. Measure the resistance between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit at the CSWM C4 harness connector.

Is the resistance 1.45 Ohms B $\pm$ 10% ?

Yes

- Go To [5](#)

No

- Go To [3](#)

3. CHECK THE HEATED STEERING WHEEL CIRCUIT RESISTANCE AT THE STEERING COLUMN CONTROL MODULE C1 COMPONENT CONNECTOR

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove the Driver Airbag in accordance with the Service Information. Refer to **[AIR BAG, DRIVER, REMOVAL AND INSTALLATION](#)**.
2. Disconnect the SCCM C1 harness connector.
3. Before proceeding, thoroughly inspect the wiring harness and connectors between the CSWM and the SCCM. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed

out, spread, corroded, or contaminated terminals and repair or replace as necessary.

4. Measure the resistance between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit at the SCCM C1 component connector.

Is the resistance 1.45 Ohms B $\pm$ 10% ?

Yes

- Repair the (C91) Heated Steering Wheel Feed circuit or the (C986) Heated Steering Wheel Return circuit for an open, high resistance or shorted condition.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE HEATED STEERING WHEEL CIRCUIT RESISTANCE AT THE STEERING COLUMN CONTROL MODULE C4 CONNECTOR

1. Disconnect the Steering Column Control Module (SCCM) C4 harness connector.
2. Before proceeding, thoroughly inspect the wiring harness and connectors between the Heated Steering Wheel (HSW) and the Steering Column Control Module. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals and repair or replace as necessary.
3. Measure the resistance between the (C91) Heated Steering Wheel Feed circuit and the (C986) Heated Steering Wheel Return circuit at the SCCM C4 harness connector.

Is the resistance 1.45 Ohms B $\pm$ 10% ?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Heated Steering Wheel (HSW) in accordance with the Service Information. Refer to **WHEEL, STEERING, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B10C4-4B-HEATED STEERING WHEEL CONTROL-OVER TEMPERATURE

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

To control the temperature of the Heated Steering Wheel (HSW), the Comfort Seat and Wheel Module (CSWM) provides power and return circuits to the HSW, using a Pulse Width Modulation (PWM) signal to control current to the heating element.

To monitor the temperature of the heating element, the HSW uses an internal Negative Temperature Coefficient (NTC) type thermistor, which is connected to the left Steering Wheel Switch (SWS). The SWS sends the temperature over a LIN bus circuit to the Steering Column Control Module (SCCM), which then sends the temperature to the CSWM over the CAN-IHS data bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Steering Wheel is turned on.

SET CONDITION

- CAN bus message for Heated Steering Wheel temperature is above the maximum allowed temperature for 2 seconds.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
HEATED STEERING WHEEL SIGNAL CIRCUIT HIGH RESISTANCE OR SHORTED
HEATED STEERING WHEEL EVIC MUX RETURN CIRCUIT HIGH RESISTANCE OR SHORTED
HEATED STEERING WHEEL SIGNAL CIRCUIT SHORTED TO THE HEATED STEERING WHEEL EVIC MUX RETURN CIRCUIT
HEATED STEERING WHEEL TEMPERATURE SENSOR
STEERING COLUMN CONTROL MODULE (SCCM)
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Start the Engine.
6. Turn the HSW on.
7. Using the scan tool, monitor the Heated Steering Wheel temperature. The value should rise steadily until the Heated Steering Wheel reaches the calibrated desired temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR HEATED STEERING WHEEL CONTROL CIRCUIT DTC(S) IN THE CSWM

1. Refer to the saved DTC information recorded on the repair order.

Were any HSW control circuit DTCs present in the CSWM?

Yes

- Perform the appropriate diagnostic procedure for the control circuit DTC(s) and retest.

No

- Go To [3](#)

3. CHECK FOR IMPLAUSIBLE HEATED STEERING WHEEL TEMPERATURE DTC IN THE CSWM

1. Refer to the saved DTC information recorded on the repair order.

Was U1446-00 - IMPLAUSIBLE HEATED STEERING WHEEL TEMPERATURE MESSAGE RECEIVED present in the CSWM?

Yes

- Perform the diagnostic procedure for U1446-00 and retest.

No

- Go To [4](#)

4. CHECK RELATED WIRING AND HARNESS CONNECTIONS

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Using the possible causes list above and the wiring diagram as a guide, inspect wiring and harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Were any problems found?

Yes

- Repair as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **5**

5. REPLACE THE HEATED STEERING WHEEL (HSW) AND CHECK FOR DTC TO RETURN

1. Replace the Heated Steering Wheel (HSW) in accordance with the Service Information. Refer to **WHEEL, STEERING, REMOVAL AND INSTALLATION** .
2. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
3. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
4. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
5. With the scan tool, erase DTCs.
6. Turn the ignition off for a minimum of 10 seconds.
7. Start the engine.
8. Turn the HSW on.
9. Using the scan tool, monitor the Heated Steering Wheel temperature. The value should rise steadily until the HSW reaches the calibrated desired temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replacing the Heated Steering Wheel (HSW) corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B11C1-13-STEERING WHEEL HEATER POWER SUPPLY CIRCUIT-CIRCUIT OPEN

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

To control the temperature of the Heated Steering Wheel (HSW), the Comfort Seat and Wheel Module (CSWM) provides power and return circuits to the HSW, using a Pulse Width Modulation (PWM) signal to control current to the heating element.

To monitor the temperature of the heating element, the HSW uses an internal Negative Temperature Coefficient (NTC) type thermistor, which is connected to the left Steering Wheel Switch (SWS). The SWS sends the temperature over a LIN bus circuit to the Steering Column Control Module (SCCM), which then sends the temperature to the CSWM over the CAN-IHS data bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects no voltage on the Fused Ignition circuit for more than 2 seconds.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION CIRCUIT OPEN OR SHORTED TO GROUND
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (F924) FUSED IGNITION CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

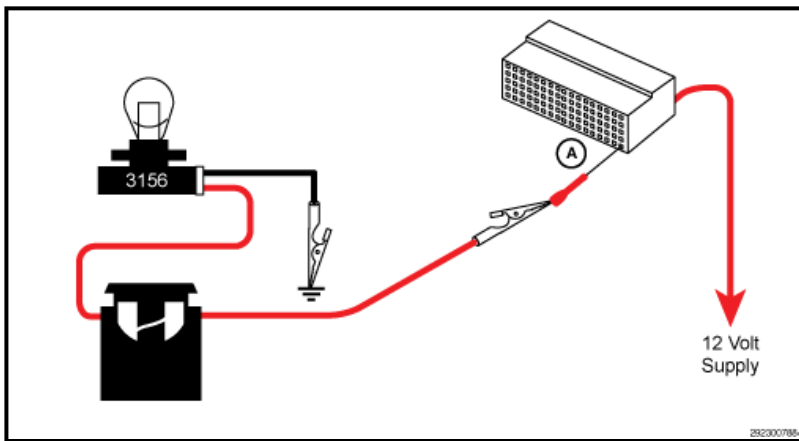
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F924) Fused Ignition circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B1E99-11-FRONT LEFT HEATER CONTROL 1-CIRCUIT SHORT TO GROUND

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Seat is turned on.

SET CONDITION

- Module detects a short to ground on the Left Front Seat Cushion Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO GROUND
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Heated Seat on.
7. With the scan tool, read CSWM DTCs.

Is the Same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (F503) Left Front Seat Cushion Heater Supply circuit?

Yes

- Repair the (F503) Left Front Seat Cushion Heater Supply circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F503) Left Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE LEFT FRONT SEAT CUSHION HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Left Front Seat Cushion Heater element between the (F503) Left Front Seat Cushion Heater Supply circuit and the (Z917) Ground circuit at the Left Seat Cushion Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.26 Ohms and 3.38 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Left Front Seat Cushion Heater element in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B1E99-12-FRONT LEFT HEATER CONTROL 1-CIRCUIT SHORT TO BATTERY

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

- Heated seat is turned off.

SET CONDITION

- Module detects that the Left Front Seat Cushion Heater Supply circuit voltage is above 5.0 volts for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: **Seat and steering wheel heaters must remain OFF during this test.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Comfort Seat Wheel Module (CSWM) C2 harness connector.
3. Start the engine.

4. Measure the voltage of the (F503) Left Front Seat Cushion Heater Supply circuit in the CSWM C2 harness connector.

Is the voltage 5.0 volts or above?

Yes

- Repair the (F503) Left Front Seat Cushion Heater Supply circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. ISOLATE AND CHECK THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F503) Left Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

B1E99-13-FRONT LEFT HEATER CONTROL 1-CIRCUIT OPEN

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects an open on the Left Front Seat Cushion Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.

- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND LOAD TEST THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

NOTE:

Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156

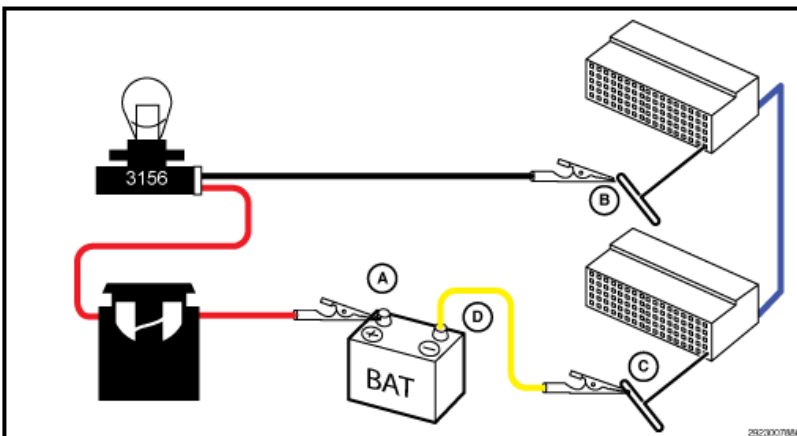
bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F503) Left Front Seat Cushion Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE (Z917) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

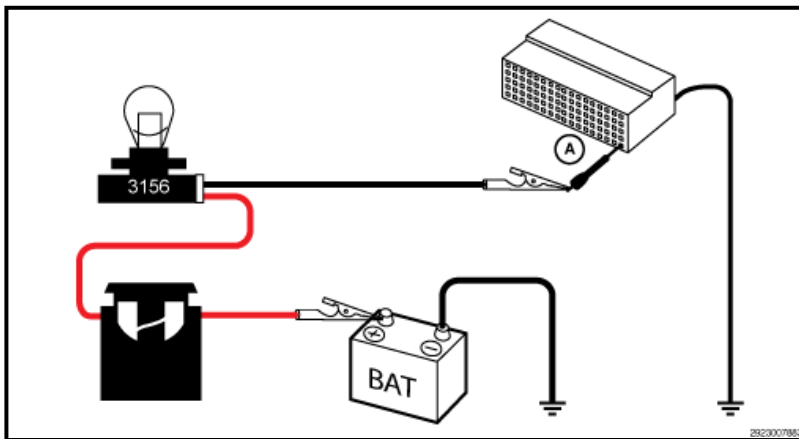
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.

- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK THE LEFT FRONT SEAT CUSHION HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Left Front Seat Cushion Heater element between the (F503) Left Front Seat Cushion Heater Supply circuit and the (Z917) Ground circuit at the Left Seat Cushion Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.26 Ohms and 3.38 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Left Front Seat Cushion Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1E99-4B-FRONT LEFT HEATER CONTROL 1-OVER TEMPERATURE

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects that the Left Front Seat Cushion Heater temperature is above the maximum allowed temperature for 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the scan tool, monitor the Left Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#).

2. ISOLATE AND CHECK THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F503) Left Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

No

- Go To [3](#)

3. REPLACE THE LEFT FRONT SEAT CUSHION HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Seat Cushion Heater element in accordance with the Service Information. Refer to [**PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**](#).
3. Connect the Left Front Seat Cushion Heater element and CSWM harness connectors.
4. With the scan tool, erase CSWM DTCs.
5. Turn the ignition off for 10.0 seconds.
6. Start the Engine.
7. Turn the Left Front Heated Seat on.
8. Using the scan tool, monitor the Left Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
9. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [4](#)

No

- Replacing the Left Front Seat Cushion Heater element repaired the fault.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. Using the scan tool, monitor the Left Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1E99-92-FRONT LEFT HEATER CONTROL 1-PERFORMANCE OR INCORRECT OPERATION

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Seat is turned on.

SET CONDITION

- Module detects that the Left Front Seat Cushion Heater temperature is below the target temperature after a calculated amount of time.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED OR HIGH RESISTANCE
LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED OR HIGH RESISTANCE
HEATED SEAT SENSOR RETURN CIRCUIT SHORTED OR HIGH RESISTANCE
GROUND CIRCUIT SHORTED OR HIGH RESISTANCE
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the scan tool, monitor the Left Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND LOAD TEST THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).**

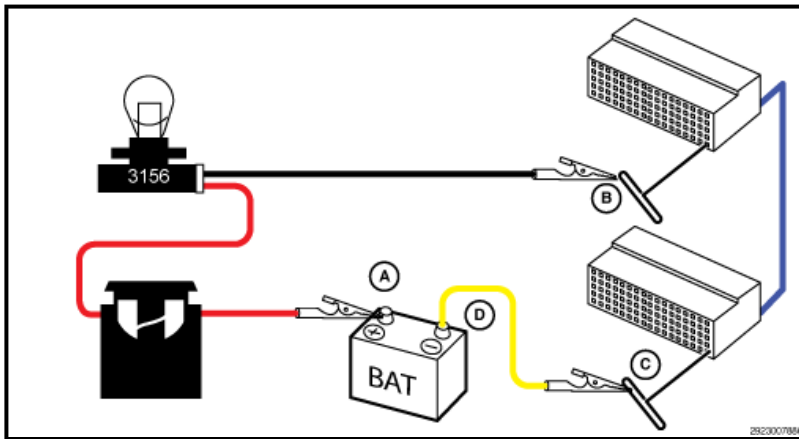
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared

to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .



WARNING: To avoid possible serious or fatal injury, **DO NOT** load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F503) Left Front Seat Cushion Heater Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. ISOLATE AND CHECK THE (F503) LEFT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F503) Left Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P413) LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P413) Left Front Heated Seat Cushion Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE (P413) LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.

4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P413) Left Front Heated Seat Cushion Temp Sense circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

7. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.

4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P419) Heated Seat Sensor Return circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (Z917) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

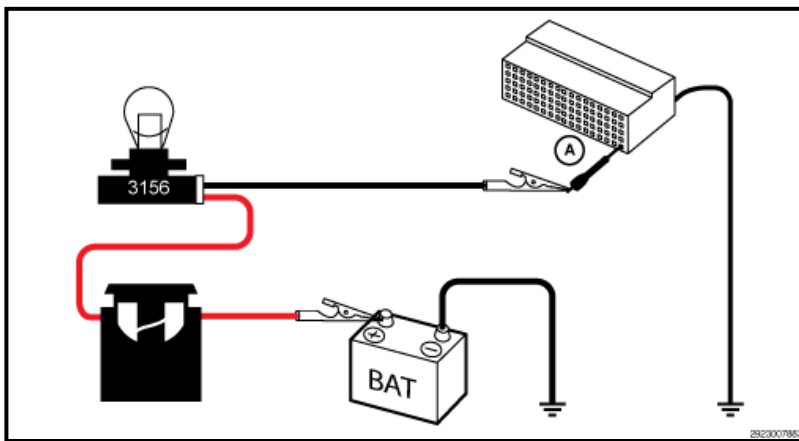
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

9. ISOLATE AND CHECK THE (Z917) GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any

possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (Z917) Ground circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

10. REPLACE THE LEFT FRONT SEAT CUSHION HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Seat Cushion Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
3. Connect the Left Front Seat Cushion Heater element and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the scan tool, monitor the Left Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [11](#)

No

- Replacing the Left Front Seat Cushion Heater element repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

11. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. Using the scan tool, monitor the Left Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B1E9A-11-FRONT RIGHT HEATER CONTROL 1-CIRCUIT SHORT TO GROUND

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Seat is turned on.

SET CONDITION

- Module detects a short to ground on the Right Front Seat Cushion Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO GROUND
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (F506) Right Front Seat Cushion Heater Supply circuit?

Yes

- Repair the (F506) Right Front Seat Cushion Heater Supply circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F506) Right Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE RIGHT FRONT SEAT CUSHION HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Right Front Seat Cushion Heater element between the (F506) Right Front Seat Cushion Heater Supply circuit and the (Z917) Ground circuit at the Right Front Seat Cushion Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.26 Ohms and 3.38 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Right Front Seat Cushion Heater element in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1E9A-12-FRONT RIGHT HEATER CONTROL 1-CIRCUIT SHORT TO BATTERY

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned off.

SET CONDITION

- Module detects that the Right Front Seat Cushion Heater Supply circuit voltage is above 5.0 volts for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: **Seat and steering wheel heaters must remain OFF during this test.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Comfort Seat Wheel Module (CSWM) C3 harness connector.
3. Start the engine.
4. Measure the voltage of the (F506) Right Front Seat Cushion Heater Supply circuit in the CSWM C3 harness connector.

Is the voltage 5.0 volts or above?

Yes

- Repair the (F506) Right Front Seat Cushion Heater Supply circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F506) Right Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1E9A-13-FRONT RIGHT HEATER CONTROL 1-CIRCUIT OPEN

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects an open on the Right Front Seat Cushion Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND LOAD TEST THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

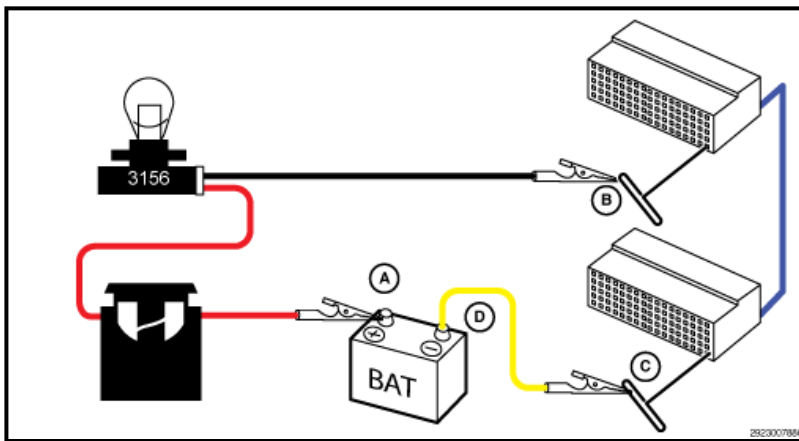
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F506) Right Front Seat Cushion Heater Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE (Z917) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load

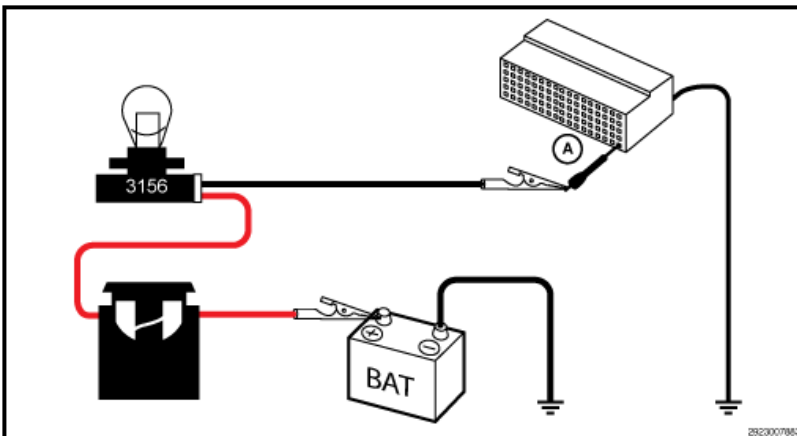
testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

4. CHECK THE RIGHT FRONT SEAT CUSHION HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Right Front Seat Cushion Heater element between the (F506) Right Front Seat Cushion Heater Supply circuit and the (Z917) Ground circuit at the Right Seat Cushion Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.26 Ohms and 3.38 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Right Front Seat Cushion Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1E9A-4B-FRONT RIGHT HEATER CONTROL 1-OVER TEMPERATURE

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects Right Front Seat Cushion Heater temperature is above the maximum allowed temperature for 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the scan tool, monitor the Right Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F506) Right Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [3](#)

3. REPLACE THE RIGHT FRONT SEAT CUSHION HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Seat Cushion Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**.

3. Connect the Right Front Seat Cushion Heater element and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the scan tool, monitor the Right Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [4](#)

No

- Replacing the Right Front Seat Cushion Heater element repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.

13. Using the scan tool, monitor the Right Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1E9A-92-FRONT RIGHT HEATER CONTROL 1-PERFORMANCE OR INCORRECT OPERATION

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects Right Front Seat Cushion Heater temperature is below the target temperature after a calculated amount of time.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT SHORTED OR HIGH RESISTANCE
RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED OR HIGH RESISTANCE
HEATED SEAT SENSOR RETURN CIRCUIT SHORTED OR HIGH RESISTANCE
GROUND CIRCUIT SHORTED OR HIGH RESISTANCE
SEAT CUSHION HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the scan tool, monitor the Right Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND LOAD TEST THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

NOTE:

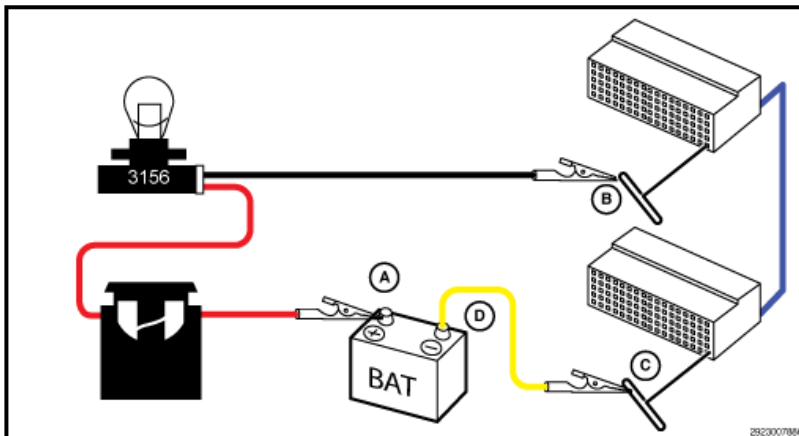
Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F506) Right Front Seat Cushion Heater Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (F506) RIGHT FRONT SEAT CUSHION HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F506) Right Front Seat Cushion Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P417) RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P417) Right Front Heated Seat Cushion Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

5. ISOLATE AND CHECK THE (P417) RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P417) Right Front Heated Seat Cushion Temp Sense circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any

possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P419) Heated Seat Sensor Return circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (Z917) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for

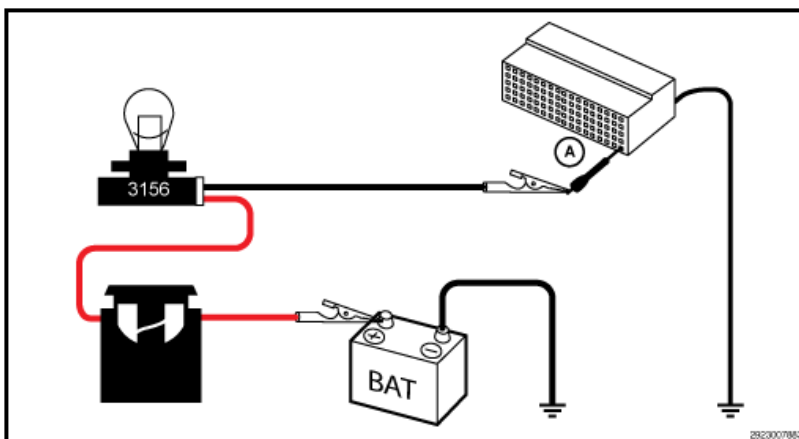
information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

9. ISOLATE AND CHECK THE (Z917) GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (Z917) Ground circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [10](#)

10. REPLACE THE RIGHT FRONT SEAT CUSHION HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Seat Cushion Heater element in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#).
3. Connect the Right Front Seat Cushion Heater element and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the scan tool, monitor the Right Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [11](#)

No

- Replacing the Right Front Seat Cushion Heater element repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

11. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. Using the scan tool, monitor the Right Front Seat Cushion temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1EB1-1A-FRONT LEFT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 19.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is below its threshold for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED TO GROUND
LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED TO THE HEATED SEAT SENSOR RETURN CIRCUIT
HEATED SEAT CUSHION TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.

7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK (P413) LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (P413) Left Front Heated Seat Cushion Temp Sense circuit?

Yes

- Repair the (P413) Left Front Heated Seat Cushion Temp Sense circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P413) LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. REPLACE THE LEFT FRONT HEATED SEAT CUSHION TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Heated Seat Cushion Temperature Sensor (Left Front Seat Cushion Heater Element) in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
3. Connect the Left Front Heated Seat Cushion Temperature Sensor (Left Front Seat Cushion Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [5](#)

No

- Replacing the Left Front Heated Seat Cushion Temperature Sensor (Left Front Seat Cushion Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1EB1-1B-FRONT LEFT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE ABOVE THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is above its threshold for more than two seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT OPEN
HEATED SEAT SENSOR RETURN CIRCUIT OPEN
HEATED SEAT CUSHION TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (P413) LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the CSWM C2 harness connector.
3. Start the engine.
4. Measure the voltage between ground and the (P413) Left Front Heated Seat Cushion Temp Sense circuit at the CSWM C2 harness connector.

Is there any voltage present?

Yes

- Repair the (P413) Left Front Heated Seat Cushion Temp Sense circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P413) LEFT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT OR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (P413) Left Front Heated Seat Cushion Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. REPLACE THE LEFT FRONT HEATED SEAT CUSHION TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Heated Seat Cushion Temperature Sensor (Left Front Seat Cushion Heater Element) in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
3. Connect the Left Front Heated Seat Cushion Temperature Sensor (Left Front Seat Cushion Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [6](#)

No

- Replacing the Left Front Heated Seat Cushion Temperature Sensor (Left Front Seat Cushion Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B1EB2-1A-FRONT RIGHT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is below its threshold for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED TO GROUND
RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED TO THE HEATED SEAT SENSOR RETURN CIRCUIT
HEATED SEAT CUSHION TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK (P417) RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (P417) Right Front Heated Seat Cushion Temp Sense circuit?

Yes

- Repair the (P417) Right Front Heated Seat Cushion Temp Sense circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P417) RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE RIGHT FRONT HEATED SEAT CUSHION TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Heated Seat Cushion Temperature Sensor (Right Front Seat Cushion Heater Element) in accordance with the Service Information. Refer to [**PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**](#) .
3. Connect the Right Front Heated Seat Cushion Temperature Sensor (Right Front Seat Cushion Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [5](#)

No

- Replacing the Right Front Heated Seat Cushion Temperature Sensor (Right Front Seat Cushion Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1EB2-1B-FRONT RIGHT SEAT HEATER SENSOR 1-CIRCUIT RESISTANCE ABOVE THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is above its threshold for more than two seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Cushion Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT SHORTED TO VOLTAGE
RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT OPEN
HEATED SEAT SENSOR RETURN CIRCUIT OPEN
HEATED SEAT CUSHION TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.

7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (P417) RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the CSWM C3 harness connector.
3. Start the Engine.
4. Measure the voltage between ground and the (P417) Right Front Heated Seat Cushion Temp Sense circuit at the CSWM C3 harness connector.

Is there any voltage present?

Yes

- Repair the (P417) Right Front Heated Seat Cushion Temp Sense circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P417) RIGHT FRONT HEATED SEAT CUSHION TEMP SENSE CIRCUIT OR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (P417) Right Front Heated Seat Cushion Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. REPLACE THE RIGHT FRONT HEATED SEAT CUSHION TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Heated Seat Cushion Temperature Sensor (Right Front Seat Cushion Heater Element) in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
3. Connect the Right Front Heated Seat Cushion Temperature Sensor (Right Front Seat Cushion Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [6](#)

No

- Replacing the Right Front Heated Seat Cushion Temperature Sensor (Right Front Seat Cushion Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F10-11-FRONT LEFT HEATER CONTROL 2-CIRCUIT SHORT TO GROUND

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects a short to ground on the Left Front Seat Back Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO GROUND
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (F507) Left Front Seat Back Heater Supply circuit?

Yes

- Repair the (F507) Left Front Seat Back Heater Supply circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F507) Left Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE LEFT FRONT SEAT BACK HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Left Front Seat Back Heater element between the (F507) Left Front Seat Back Heater Supply circuit and the (Z917) Ground circuit at the Left Seat Back Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.43 Ohms and 3.65 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Left Front Seat Back Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [**MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B1F10-12-FRONT LEFT HEATER CONTROL 2-CIRCUIT SHORT TO BATTERY

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned off.

SET CONDITION

- Module detects that the Left Front Seat Back Heater Supply circuit voltage is above 5.0 volts for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: **Seat and steering wheel heaters must remain OFF during this test.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Comfort Seat Wheel Module (CSWM) C2 harness connector.
3. Start the engine.
4. Measure the voltage of the (F507) Left Front Seat Back Heater Supply circuit in the CSWM C2 harness connector.

Is the voltage 5.0 volts or above?

Yes

- Repair the (F507) Left Front Seat Back Heater Supply circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F507) Left Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B1F10-13-FRONT LEFT HEATER CONTROL 2-CIRCUIT OPEN

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects an open on the Left Front Seat Back Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND LOAD TEST THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

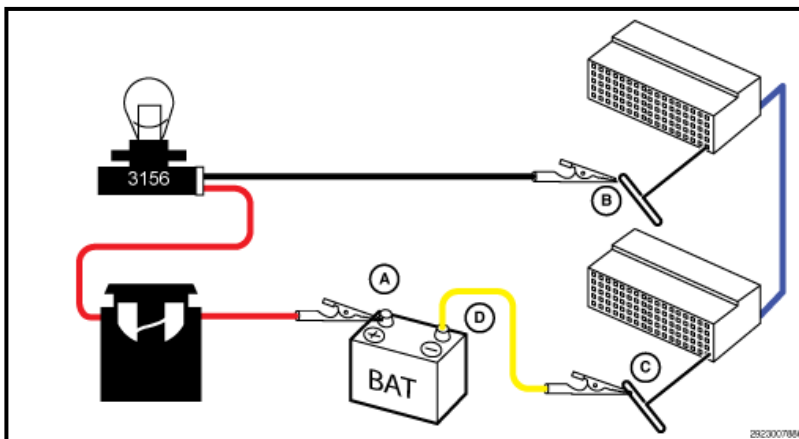
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



WARNING: To avoid possible serious or fatal injury, **DO NOT** load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F507) Left Front Seat Back Heater Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE (Z917) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

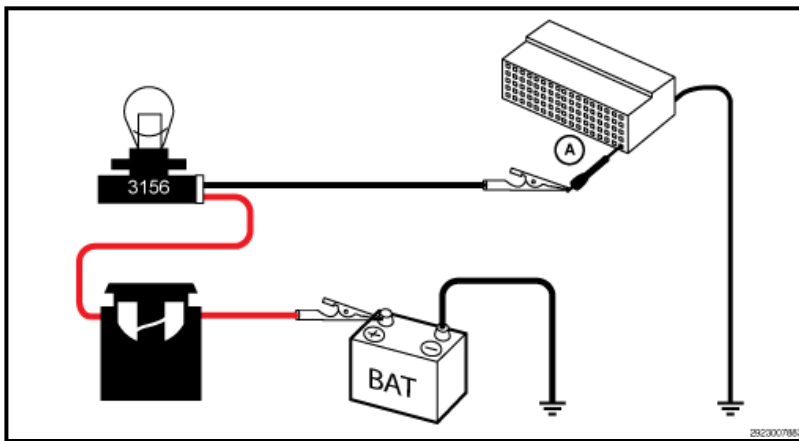
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE LEFT FRONT SEAT BACK HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Left Front Seat Back Heater element between the (F507) Left Front Seat Back Heater Supply circuit and the (Z917) Ground circuit at the Left Front Seat Back Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.43 Ohms and 3.65 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Left Front Seat Back Heater element in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B1F10-4B-FRONT LEFT HEATER CONTROL 2-OVER TEMPERATURE

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated Seat is turned on.

SET CONDITION

- Module detects that the Left Front Seat Back Heater temperature is above the maximum allowed temperature for 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the scan tool, monitor the Left Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F507) Left Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. REPLACE THE LEFT FRONT SEAT BACK HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Seat Back Heater element in accordance with the Service Information. Refer to [**PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**](#) .
3. Connect the Left Front Seat Back Heater element and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the scan tool, monitor the Left Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [**4**](#)

No

- Replacing the Left Front Seat Back Heater element repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. Using the scan tool, monitor the Left Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F10-92-FRONT LEFT HEATER CONTROL 2-PERFORMANCE OR INCORRECT OPERATION

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

- Heated seat is turned on.

SET CONDITION

- Module detects that the Left Front Seat Back Heater temperature is below the target temperature after a calculated amount of time.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED OR HIGH RESISTANCE
LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED OR HIGH RESISTANCE
HEATED SEAT SENSOR RETURN CIRCUIT SHORTED OR HIGH RESISTANCE
GROUND CIRCUIT SHORTED OR HIGH RESISTANCE
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the scan tool, monitor the Left Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND LOAD TEST THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

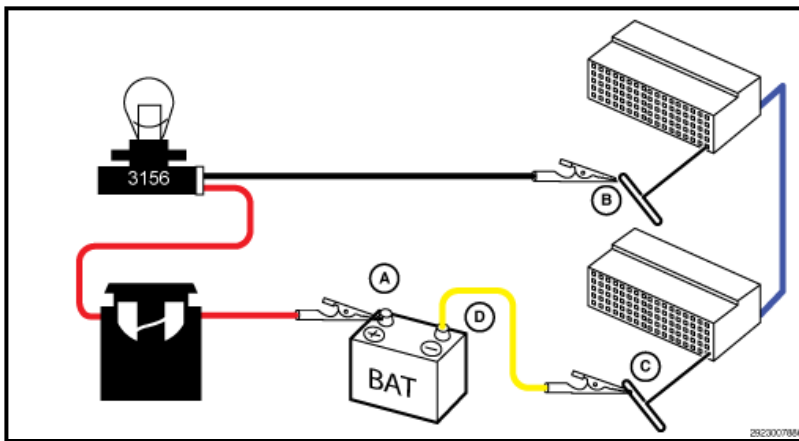
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F507) Left Front Seat Back Heater Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (F507) LEFT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F507) Left Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P415) LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P415) Left Front Heated Seat Back Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. ISOLATE AND CHECK THE (P415) LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P415) Left Front Heated Seat Back Temp Sense circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P419) Heated Seat Sensor Return circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (Z917) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

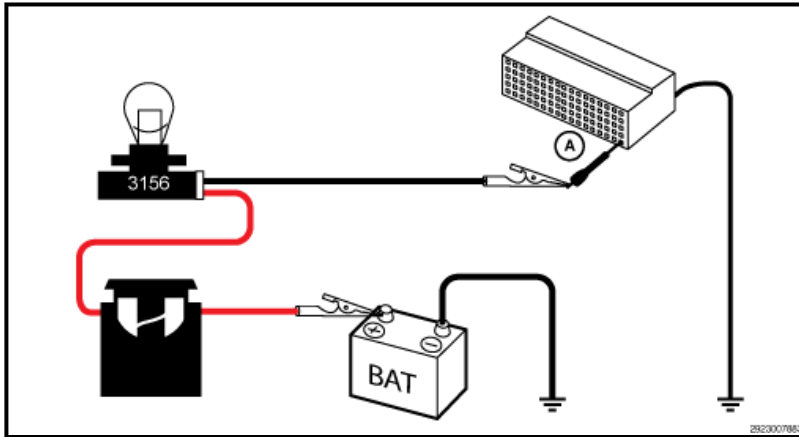
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and

alternative methods of load testing or voltage drop. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

9. ISOLATE AND CHECK THE (Z917) GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (Z917) Ground circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

10. REPLACE THE LEFT FRONT SEAT BACK HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Seat Back Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
3. Connect the Left Front Seat Back Heater element and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the scan tool, monitor the Left Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [11](#)

No

- Replacing the Left Front Seat Back Heater element repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

11. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. Using the scan tool, monitor the Left Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [**MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B1F11-11-FRONT RIGHT HEATER CONTROL 2-CIRCUIT SHORT TO GROUND

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects a short to ground on the Right Front Seat Back Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO GROUND
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (F508) Right Front Seat Back Heater Supply circuit?

Yes

- Repair the (F508) Right Front Seat Back Heater Supply circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F508) Right Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE RIGHT FRONT SEAT BACK HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Right Front Seat Back Heater element between the (F508) Right Front Seat Back Heater Supply circuit and the (Z917) Ground circuit at the Right Front Seat Back Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.43 Ohms and 3.65 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Right Front Seat Back Heater element in accordance with the Service Information. Refer to [**PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**](#) .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F11-12-FRONT RIGHT HEATER CONTROL 2-CIRCUIT SHORT TO BATTERY

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned off.

SET CONDITION

- Module detects that the Right Front Seat Back Heater Supply circuit voltage is above 5.0 volts for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: **Seat and steering wheel heaters must remain OFF during this test.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Comfort Seat Wheel Module (CSWM) C3 harness connector.
3. Start the Engine.
4. Measure the voltage of the (F508) Right Front Seat Back Heater Supply circuit in the CSWM C3 harness connector.

Is the voltage 5.0 volts or above?

Yes

- Repair the (F508) Right Front Seat Back Heater Supply circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F508) Right Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F11-13-FRONT RIGHT HEATER CONTROL 2-CIRCUIT OPEN

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects an open on the Right Front Seat Back Heater Supply circuit for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND LOAD TEST THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).

5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE:

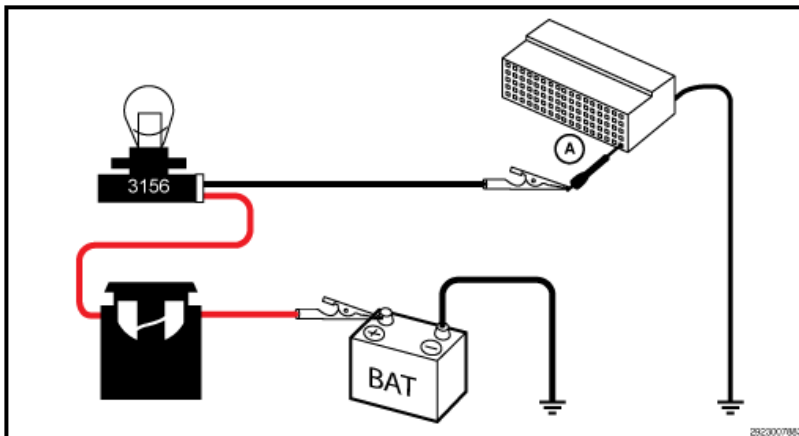
testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK THE RIGHT FRONT SEAT BACK HEATER ELEMENT RESISTANCE

1. Measure the resistance of the Right Front Seat Back Heater element between the (F508) Right Front Seat Back Heater Supply circuit and the (Z917) Ground circuit at the Right Seat Back Heater component connector.

NOTE: When probing a circuit always use an appropriate back probing tool to prevent any possible damage to the terminals.

Is the resistance between 2.43 Ohms and 3.65 Ohms at 20B°C (68B°F)?

Yes

- Go To [5](#)

No

- Replace the Right Front Seat Back Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [**MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B1F11-4B-FRONT RIGHT HEATER CONTROL 2-OVER TEMPERATURE

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects that the Right Front Seat Back Heater temperature is above the maximum allowed temperature for 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the scan tool, monitor the Right Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F508) Right Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [3](#)

3. REPLACE THE RIGHT FRONT SEAT BACK HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Seat Back Heater element in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**.
3. Connect the Right Front Seat Back Heater element and CSWM harness connectors.
4. Turn the ignition on.

5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the scan tool, monitor the Right Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [4](#)

No

- Replacing the Right Front Seat Back Heater element repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. Using the scan tool, monitor the Right Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.

14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [**MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B1F11-92-FRONT RIGHT HEATER CONTROL 2-PERFORMANCE OR INCORRECT OPERATION

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.
- Heated seat is turned on.

SET CONDITION

- Module detects that the Right Front Seat Back Heater temperature is below the target temperature after a calculated amount of time.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT SHORTED OR HIGH RESISTANCE
RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED OR HIGH RESISTANCE
HEATED SEAT SENSOR RETURN CIRCUIT SHORTED OR HIGH RESISTANCE
GROUND CIRCUIT SHORTED HIGH RESISTANCE
SEAT BACK HEATER ELEMENT
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the scan tool, monitor the Right Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND LOAD TEST THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT TO CHECK FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

NOTE:

Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE:

Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load

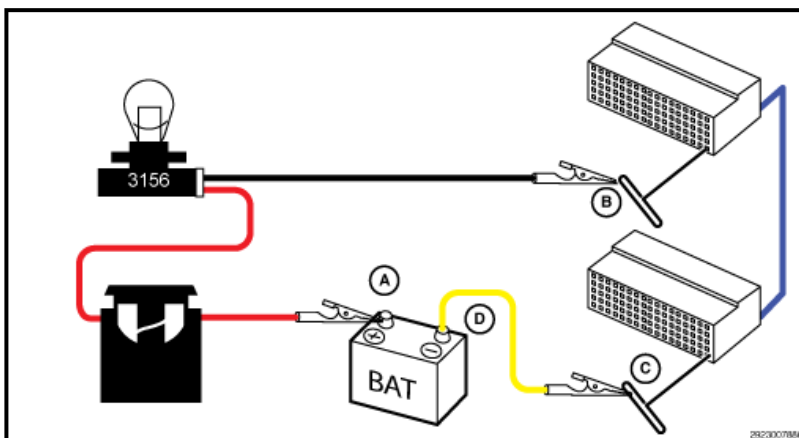
test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



WARNING:

To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION:

Do not load test any circuits with components still connected to the circuit.

NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F508) Right Front Seat Back Heater Supply circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (F508) RIGHT FRONT SEAT BACK HEATER SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (F508) Right Front Seat Back Heater Supply circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P418) RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P418) Right Front Heated Seat Back Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. ISOLATE AND CHECK THE (P418) RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P418) Right Front Heated Seat Back Temp Sense circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

7. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (P419) Heated Seat Sensor Return circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE (Z917) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

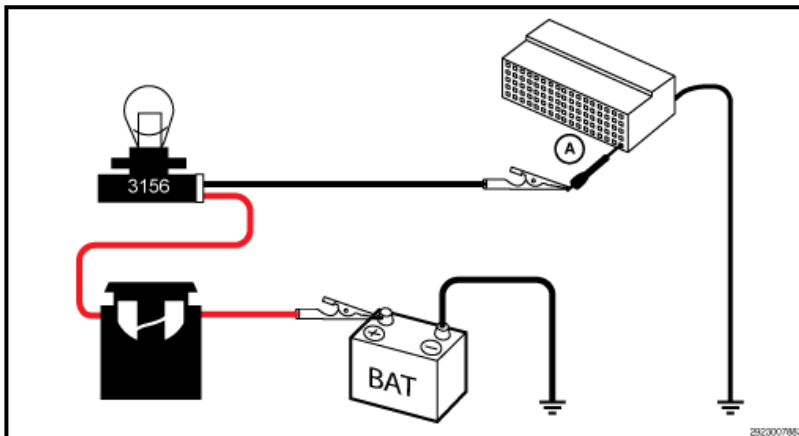
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the (Z917) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

9. ISOLATE AND CHECK THE (Z917) GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE CSWM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the (Z917) Ground circuit and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [10](#)

10. REPLACE THE RIGHT FRONT SEAT BACK HEATER ELEMENT AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Seat Back Heater element in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
3. Connect the Right Front Seat Back Heater element and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the scan tool, monitor the Right Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [11](#)

No

- Replacing the Right Front Seat Back Heater element repaired the fault.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

11. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. Using the scan tool, monitor the Right Front Seat Back temperature. The value should rise steadily until the seat reaches the calibrated target temperature. This will take several minutes.
14. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F16-1A-FRONT LEFT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is below its threshold for more than 2 seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED TO GROUND
LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED TO THE HEATED SEAT SENSOR RETURN CIRCUIT
HEATED SEAT BACK TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK (P415) LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (P415) Left Front Heated Seat Back Temp Sense circuit?

Yes

- Repair the (P415) Left Front Heated Seat Back Temp Sense circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P415) LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. REPLACE THE LEFT FRONT HEATED SEAT BACK TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Heated Seat Back Temperature Sensor (Left Front Seat Back Heater Element) in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION** .
3. Connect the Left Front Heated Seat Back Temperature Sensor (Left Front Seat Back Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [5](#)

No

- Replacing the Left Front Heated Seat Back Temperature Sensor (Left Front Seat Back Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F16-1B-FRONT LEFT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE ABOVE THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is above its threshold for more than two seconds.

DEFAULT ACTION

- When the Left Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Left Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT OPEN
HEATED SEAT SENSOR RETURN CIRCUIT OPEN
HEATED SEAT BACK TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Left Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (P415) LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the CSWM C2 harness connector.
3. Start the Engine.
4. Measure the voltage between ground and the (P415) Left Front Heated Seat Back Temp Sense circuit at the CSWM C2 harness connector.

Is there any voltage present?

Yes

- Repair the (P415) Left Front Heated Seat Back Temp Sense circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P415) LEFT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT OR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (P415) Left Front Heated Seat Back Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. REPLACE THE LEFT FRONT HEATED SEAT BACK TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Left Front Heated Seat Back Temperature Sensor (Left Front Seat Back Heater Element) in accordance with the Service Information. Refer to **PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION**.
3. Connect the Left Front Heated Seat Back Temperature Sensor (Left Front Seat Back Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Left Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [6](#)

No

- Replacing the Left Front Heated Seat Back Temperature Sensor (Left Front Seat Back Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Left Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F17-1A-FRONT RIGHT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE BELOW THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is below its threshold for more than 2 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED TO GROUND
RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED TO THE HEATED SEAT SENSOR RETURN CIRCUIT
HEATED SEAT BACK TEMPERATURE SENSOR

Possible Causes

COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK (P418) RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the (P418) Right Front Heated Seat Back Temp Sense circuit?

Yes

- Repair the (P418) Right Front Heated Seat Back Temp Sense circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to

help isolate the location of the short.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P418) RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO THE (P419) HEATED SEAT SENSOR RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE RIGHT FRONT HEATED SEAT BACK TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Heated Seat Back Temperature Sensor (Right Front Seat Back Heater Element) in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
3. Connect the Right Front Heated Seat Back Temperature Sensor (Right Front Seat Back Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [5](#)

No

- Replacing the Right Front Heated Seat Back Temperature Sensor (Right Front Seat Back Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed BACK into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B1F17-1B-FRONT RIGHT SEAT HEATER SENSOR 2-CIRCUIT RESISTANCE ABOVE THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module detects that the signal from the Negative Temperature Coefficient (NTC) thermistor is above its threshold for more than two seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Seat Back Heater output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT SHORTED TO VOLTAGE
RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT OPEN
HEATED SEAT SENSOR RETURN CIRCUIT OPEN
HEATED SEAT BACK TEMPERATURE SENSOR
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Turn the Right Front Heated Seat on.
7. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (P418) RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the CSWM C3 harness connector.
3. Start the Engine.
4. Measure the voltage between ground and the (P418) Right Front Heated Seat Back Temp Sense circuit at the CSWM C3 harness connector.

Is there any voltage present?

Yes

- Repair the (P418) Right Front Heated Seat Back Temp Sense circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (P418) RIGHT FRONT HEATED SEAT BACK TEMP SENSE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (P418) Right Front Heated Seat Back Temp Sense circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. ISOLATE AND CHECK THE (P419) RIGHT FRONT HEATED SEAT SENSOR RETURN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (P419) Heated Seat Sensor Return circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. REPLACE THE RIGHT FRONT HEATED SEAT BACK TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Right Front Heated Seat Back Temperature Sensor (Right Front Seat Back Heater Element) in accordance with the Service Information. Refer to [PAD, HEATER, CUSHION, REMOVAL AND INSTALLATION](#) .
3. Connect the Right Front Heated Seat Back Temperature Sensor (Right Front Seat Back Heater Element) and CSWM harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase CSWM DTCs.
6. Turn the ignition off for 10.0 seconds.
7. Start the Engine.
8. Turn the Right Front Heated Seat on.
9. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [6](#)

No

- Replacing the Right Front Heated Seat Back Temperature Sensor (Right Front Seat Back Heater Element) repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase CSWM DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Start the Engine.
12. Turn the Right Front Heated Seat on.
13. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Engine running.

SET CONDITION

- Module detects a voltage below 9.0 volts on the Fused Ignition circuit for more than 60 seconds.

DEFAULT ACTION

- No control of Comfort Seat Wheel Module (CSWM) functions.

POSSIBLE CAUSES

Possible Causes
RELATED DTCS PRESENT IN POWERTRAIN CONTROL MODULE (PCM) OR BODY CONTROL MODULE (BCM)
LOW BATTERY VOLTAGE
FUSED IGNITION CIRCUIT HIGH RESISTANCE
GROUND CIRCUIT HIGH RESISTANCE
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCS.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE PCM

1. With the scan tool, check the PCM for Battery and Charging System DTCS.

Are any Battery or Charging System DTCS set?

Yes

- Perform the appropriate PCM DTC diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BCM

1. With the scan tool, check the BCM for Battery and Charging System DTCS.

Are any Battery or Charging System DTCS set?

Yes

- Perform the appropriate BCM DTC diagnostic procedure(s). Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE (F921) FUSED IGNITION CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

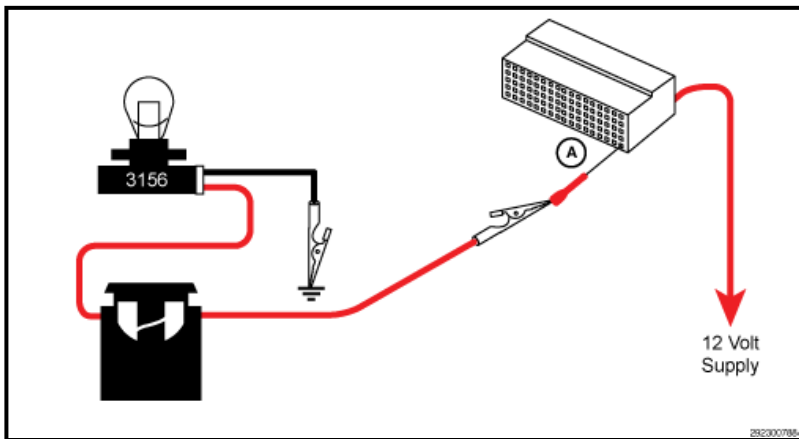
NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (F921) Fused Ignition circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. CHECK THE (Z914) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

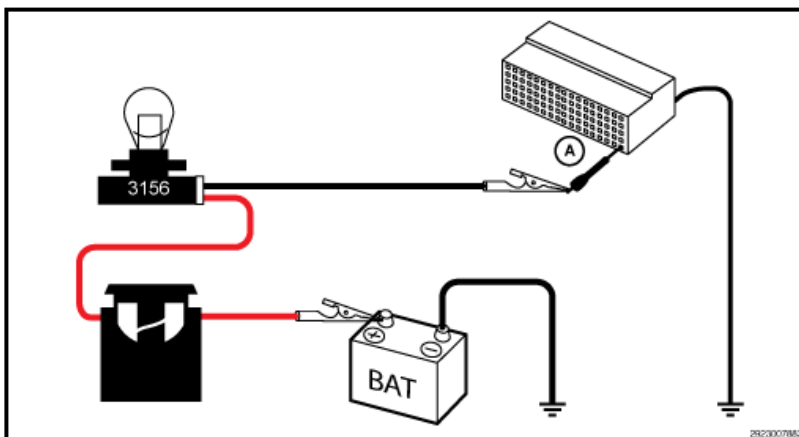
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the (Z914) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete HEATED SEAT SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.

SET CONDITION

- Module detects a voltage above 16.0 volts on the Fused Ignition circuit for more than 60 seconds.

DEFAULT ACTION

- No control of Comfort Seat Wheel Module (CSWM) functions.

POSSIBLE CAUSES

Possible Causes
RELATED DTCS PRESENT IN POWERTRAIN CONTROL MODULE (PCM) OR BODY CONTROL MODULE (BCM)
OVERCHARGE CONDITION
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR MODULE SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

3. CHECK FOR PCM BATTERY OR CHARGING SYSTEM DTCs

1. Refer to the recorded DTCs.

Are there any PCM battery OR charging system DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK OTHER MODULES FOR DTCs

1. With the scan tool, read DTCs.

Are there any other Modules setting a high system voltage DTC?

Yes

- Check the battery and charging system in accordance with the Service Information for an overcharge or high voltage condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK RELATED CSWM AND COMPONENT CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Engine running.

SET CONDITION

- The CAN bus message for battery voltage is below 9.0 volts for 15 seconds.

DEFAULT ACTION

- No control of Comfort Seat Wheel Module (CSWM) functions.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE LOW
BODY CONTROL MODULE (BCM) DTCS
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK BATTERY VOLTAGE BUSSED INPUT

1. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
2. With the scan tool, monitor the CSWM Battery Voltage bussed input for at least 60 seconds.

Does the CSWM Battery Voltage reading drop below 9.0 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK FOR VOLTAGE RELATED DTCS IN THE BODY CONTROL MODULE (BCM)

1. With the scan tool, read BCM DTCs.

Are any charging system BCM DTCs present?

Yes

- Perform the appropriate BCM DTC diagnostic procedure(s). Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.

SET CONDITION

- The CAN bus message for battery voltage is above 16.0 volts for 60 seconds.

DEFAULT ACTION

- No control of Comfort Seat Wheel Module (CSWM) functions.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM
BODY CONTROL MODULE (BCM) DTCS
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK BATTERY VOLTAGE BUSSED INPUT

1. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
2. With the scan tool, monitor the CSWM Battery Voltage bussed input for at least 60 seconds.

Is the CSWM Battery Voltage reading above 16.0 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK FOR VOLTAGE RELATED DTCS IN THE BODY CONTROL MODULE (BCM)

1. With the scan tool, read BCM DTCs.

Are any charging system BCM DTCs present?

Yes

- Perform the appropriate BCM DTC diagnostic procedure(s). Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all CSWM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B2204-00-ECU CONFIGURATION MISMATCH

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts

SET CONDITION

- The Comfort Seat Wheel Module (CSWM) configuration code does not match actual vehicle configuration.

DEFAULT ACTION

- When any CSWM function is turned on, the indicator turns on for 2 seconds and turns off.
- The corresponding output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
COMFORT SEAT WHEEL MODULE (CSWM) NOT CONFIGURED OR CONFIGURED INCORRECTLY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Diagnose and repair any Vehicle Identification Number (VIN) or Communication DTCs before continuing with this test.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE BODY CONTROL MODULE (BCM) FOR PROPER VEHICLE CONFIGURATION

1. With the scan tool verify the vehicle configuration is correct in the BCM.
2. With the scan tool, perform any available Comfort Seat Wheel Module (CSWM) software updates or calibration procedures in accordance with the service information.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for 10 seconds.
5. Start the engine.
6. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Verify that the proper Vehicle Identification Number (VIN) is stored in the PCM and BCM. Check for any Service Bulletins that may apply.
- If no problems are found, replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Test Complete.

B227E-00-ECU OVER TEMPERATURE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts

SET CONDITION

- Module detects that the internal temperature exceeded 120 degrees C for 500 ms.

DEFAULT ACTION

- When any CSWM function is turned on, the indicator turns on for 2 seconds and turns off.
- The corresponding output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
COMFORT SEAT WHEEL MODULE (CSWM) OVER TEMPERATURE
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**

NOTE: Allow the vehicle to cool down for at least one hour before proceeding with test.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Comfort Seat Wheel Module (CSWM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Turn the ignition off for 10 seconds.
10. Start the engine.
11. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service information. Refer to [MODULE, COMFORT SEAT AND WHEEL \(CSWM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B22A9-00-ECU INTERNAL PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Comfort Seat Wheel Module (CSWM) fails an internal self test.

DEFAULT ACTION

- No control of Comfort Seat Wheel Module (CSWM) functions.

POSSIBLE CAUSES

Possible Causes
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK RELATED WIRING AND CONNECTORS

1. Turn the ignition off.
2. Disconnect all related ECU harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect all related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all ECU harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. Turn the ignition on.
10. With the scan tool, erase DTCs.
11. Turn the ignition off for 10 seconds.
12. Start the engine.
13. With the scan tool, read DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

For a complete HEATED SEAT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides a variable Pulse Width Modulation (PWM) signal to the Heated Seat element in each seat cushion and seat back. The CSWM provides temperature sense and return circuits to a thermistor in order to monitor and regulate Heated Seat element function.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.

SET CONDITION

- The Fused Ignition circuit voltage at the Comfort Seat Wheel Module (CSWM) is low for 3 seconds.

DEFAULT ACTION

- When the Right Front Heated Seat is turned on, the indicator turns on for 2 seconds and turns off.
- The Right Front Heated Seat output drivers will be turned off.

POSSIBLE CAUSES

Possible Causes
RELATED LOW VOLTAGE DTCS PRESENT
FUSED IGNITION CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
COMFORT SEAT WHEEL MODULE (CSWM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the Engine.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read CSWM DTCS.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. CHECK THE (F922) FUSED IGNITION CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

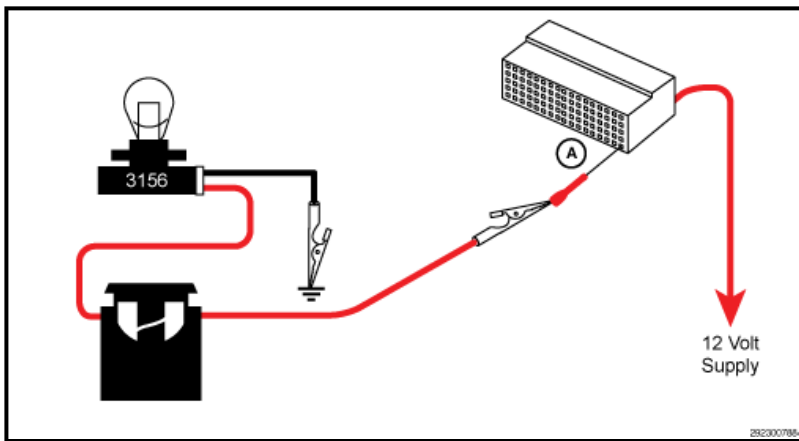
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES**](#) .**



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F922) Fused Ignition circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE (Z914) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

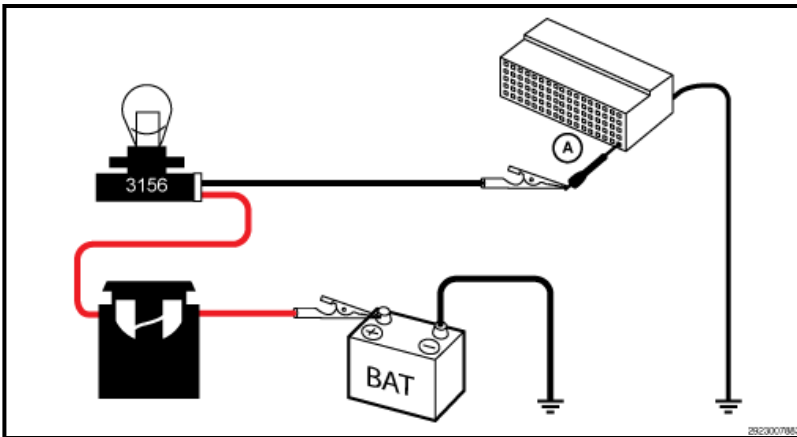
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

**NOTE:**

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (Z914) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all CSWM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).

4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all CSWM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Turn the ignition off for 10.0 seconds.
11. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
12. With the scan tool, read CSWM DTCs.

Is the same DTC active?

Yes

- Replace the Comfort Seat Wheel Module (CSWM) in accordance with the Service Information. Refer to **MODULE, COMFORT SEAT AND WHEEL (CSWM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX**.

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0184-00-LOST COMMUNICATION WITH RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U11B8-00 LOST COMMUNICATION WITH INTEGRATED CENTER STACK (ICS)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1446-00-IMPLAUSIBLE HEATED STEERING WHEEL TEMPERATURE MESSAGE RECEIVED

For a complete HEATED STEERING WHEEL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Comfort Seat and Wheel Module (CSWM) provides power and return to the steering wheel heating element, using PWM to control the hard wired signals. The Heated Steering Wheel (HSW) contains a Negative Temperature Coefficient (NTC) type thermistor for temperature sensing, and provides feedback to the Steering Wheel Switch (SWS) using hard wired signal and return circuits. The SWS reports the temperature using a LIN signal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.
- Controller voltage between 9.0 and 16.0 volts.

SET CONDITION

- Module receives an implausible CAN bus message from the Heated Steering Wheel (HSW) Temperature Sensor for more than two seconds.

DEFAULT ACTION

- When the Heated Steering Wheel is turned on, the indicator turns on for 2 seconds and turns off.
- The Heated Steering Wheel output driver will be turned off.

POSSIBLE CAUSES

Possible Causes
RELATED LIN OR CAN COMMUNICATION DTCS
HEATED STEERING WHEEL TEMPERATURE SENSOR
LEFT STEERING WHEEL SWITCH

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. **Diagnose and repair all active Bus related Diagnostic Trouble Codes (DTCs) including Lost Communication DTCs before diagnosing this DTC.**
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

Is this DTC active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK HEATED STEERING WHEEL TEMPERATURE SENSOR MESSAGE STATUS

1. With the scan tool, check the status of the Heated Steering Wheel Temperature Sensor.

Does the Heated Steering Wheel Temperature Sensor status read "Signal Not Available (SNA)"?

Yes

- Go To [3](#)

No

- The conditions that caused this DTC are not present at this time.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

3. PERFORM VISUAL INSPECTION OF HEATED STEERING WHEEL TEMPERATURE SENSOR CONNECTORS, TERMINALS AND WIRING

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove the Driver Airbag in accordance with the Service Information. Refer to [AIR BAG, DRIVER, REMOVAL AND INSTALLATION](#) .
2. Disconnect all Heated Steering Wheel Temperature Sensor related harness connectors.
3. Inspect the harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Were any problems found?

Yes

- Repair or replace the Heated Steering Wheel Temperature Sensor wiring harness in accordance with Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **4**

4. CHECK THE HEATED STEERING WHEEL TEMPERATURE SENSOR RESISTANCE

1. Measure the resistance of the Heated Steering Wheel Temperature Sensor between the (C92) Heated Steering Wheel Signal circuit and the (G907) EVIC Mux Return circuit at the Heated Steering Wheel Temperature Sensor component connector.
2. Compare your findings to the chart below:

Temperature Sensor Resistance				
B°C	B°F	Nominal (Ohms)	Minimum (Ohms)	Maximum (Ohms)
0	32	32650	30601	34699
5	41	25388	23861	26914
10	50	19900	18754	21046
15	59	15708	14842	16574
20	68	12490	11831	13149
25	77	10000	9500	10500
30	86	8057	7632	8482
35	95	6531	6173	6889
40	104	5327	5024	5630
45	113	4369	4111	4626
50	122	3603	3384	3822
55	131	2986	2799	3174
60	140	2488	2327	2649
65	149	2083	1945	2221
70	158	1752	1633	1871
75	167	1481	1378	1585
80	176	1258	1168	1348
85	185	1072	994.2	1151
90	194	917.7	849.4	986.0
95	203	788.5	728.6	848.4
100	212	680.0	627.4	732.6

Is the resistance within range?

Yes

- Replace the Left EVIC Switch in accordance with the Service Information. Refer to **SWITCH, EVIC CONTROL, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** s.

No

- Replace the Heated Steering Wheel Temperature Sensor (Heated Steering Wheel (HSW)) in accordance with the Service Information. Refer to **WHEEL, STEERING, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

2021 ACCESSORIES AND BODY, CAB

Communication - NON-DTC Based Diagnostics - Gladiator

DIAGNOSIS AND TESTING

MULTIPLE MODULES WILL NOT COMMUNICATE WITH CAN C OR IHS

THEORY OF OPERATION

Depending upon the vehicle configuration for CAN-C or IHS, there can be multiple Controller Area Network (CAN) Bus Star Connectors located throughout the vehicle. The Star Connectors contain the CAN terminating resistors and are located so that they can be accessed for diagnosis of the CAN Bus networks. For an in-depth explanation of the Controller Area Network (CAN) Bus system operation, refer to the appropriate service information.

The (special tool #2073400080, Kit, PowerNet / CUSW CAN BUS Diagnostic Tool), is used in place of a Star Connector to assist in CAN Bus network diagnosis. The diagram on the front displays how the tool is to be used, while the back displays a schematic which will be helpful when using the CAN Bus diagnostic tools. The tool kit consists of a 2-Pin ECU testers and one 3-Pin Star Connector tester.

NOTE: **Wording on the PowerNet / CUSW CAN BUS Diagnostic Tool shows "STAR BLOCK" instead of "STAR CONNECTOR".**

2-PIN CAN BUS DIAGNOSTIC TOOL

- The 2-Pin CAN Bus diagnostic tool being used for testing between a Star Connector and Electronic Control Unit (ECU), **does not contain** an in-line resistor. The CAN Bus Diagnostic Tools use toggle switches to Connect and Disconnect the tool to the CAN Bus network being tested on. When the 2-Pin CAN Bus diagnostic tool is connected to a CAN, it is wired in series to the CAN Bus network. The 2-Pin CAN Bus diagnostic tool uses the flow of the CAN through a Star Connector, **through the CAN Bus diagnostic tool**, and then downstream to the ECU in question for testing.

NOTE: **CAN Bus systems using Star Connectors are configured with one or two Star Connectors. Those systems having one Star Connector contain a 60.0 Ohm resistor; and systems with two Star Connectors contain 120.0 Ohm terminating resistors that are**

wired in parallel

to allow communication with 60.0 Ohms.

Further testing with the (special tool #2073400080, Kit, PowerNet / CUSW CAN BUS Diagnostic Tool) testing ports are equivalent to the CAN C and IHS Bus (+) and (-) circuits and can be used to read CAN Bus measurements with a DVOM or analyze waveform patterns with an Oscilloscope.



NOTE: Wording on the PowerNet / CUSW CAN BUS Diagnostic Tool shows "STAR BLOCK" instead of "STAR CONNECTOR".

3-PIN CAN BUS DIAGNOSTIC TOOL

- The 3-Pin CAN Bus diagnostic tool being used for the testing of a Star Connector **does contain** a separate in-line 120.0 Ohm resistor for each switch. The CAN Bus Diagnostic Tools use toggle switches to Connect and Disconnect the tool to the CAN Bus network being tested on. When the 3-Pin CAN Bus diagnostic tool is connected to a CAN, it is wired in series to the CAN Bus network. The 3-Pin CAN Bus diagnostic tool uses the flow of the CAN **through the CAN Bus diagnostic tool** , to the Star connector in question for testing, and then continues on to the downstream ECUs.

The 3-Pin resistance table below shows the resistance values the 3-Pin CAN Bus diagnostic tool will add to the CAN being tested.

3-PIN RESISTANCE TABLE

SWITCH - TO STAR BLOCK	SWITCH - HARNESS TO OTHER STAR BLOCK	APPROXIMATE RESISTANCE WHEN MEASURED WITH DVOM
CONNECTED	CONNECTED	OL (OUT OF LIMIT) / PASS THROUGH FOR VEHICLE CAN
CONNECTED	DISCONNECTED	120

SWITCH - TO STAR BLOCK	SWITCH - HARNESS TO OTHER STAR BLOCK	APPROXIMATE RESISTANCE WHEN MEASURED WITH DVOM
DISCONNECTED	CONNECTED	120
DISCONNECTED	DISCONNECTED	60 (BOTH SWITCHES IN PARALLEL)

NOTE: CAN Bus systems using Star Connectors are configured with one or two Star Connectors. Those systems having one Star Connector contain a 60.0 Ohm resistor; and systems with two Star Connectors contain 120.0 Ohm terminating resistors that are

wired in parallel

to allow communication with 60.0 Ohms.

Further testing with an oscilloscope or DVOM can be performed at the testing ports of the (special tool #2073400080, Kit, PowerNet / CUSW CAN BUS Diagnostic Tool).



CAN BUS OPERATIONAL VOLTAGES

CAN C Bus Operational Voltages								
CAN C Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

CAN IHS Bus Operational Voltages							
CAN IHS Circuits	Key-Off (Bus Asleep)	Key-On (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0.0 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0.0 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

Notes

All measurements were taken between a node ground and a CAN Bus terminal, using a standard DVOM. The DVOM will display the average network voltage.

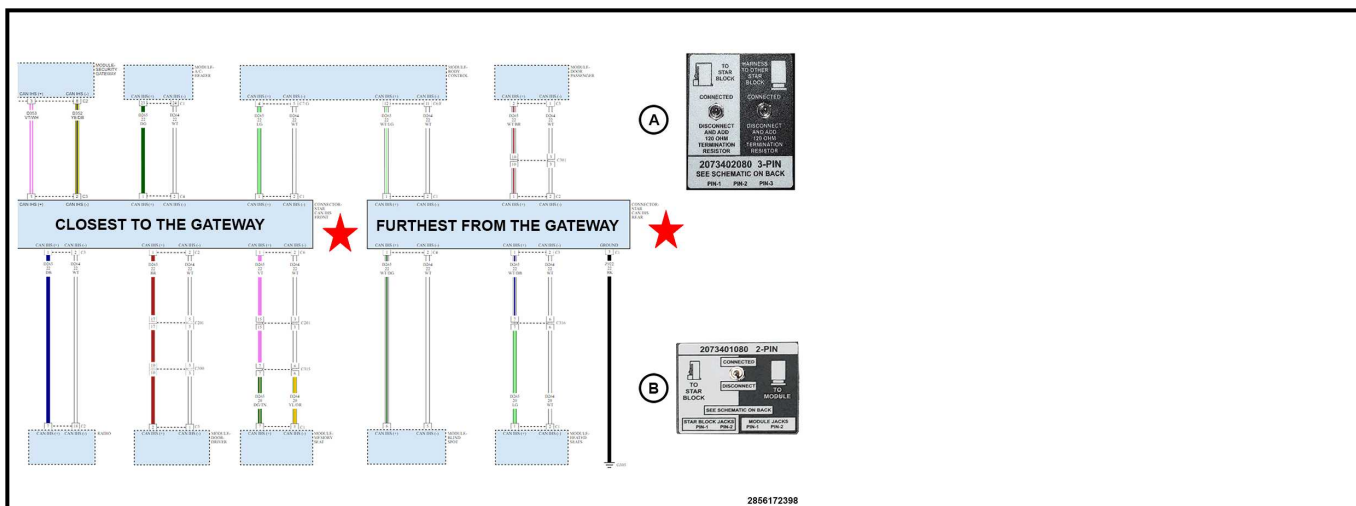
Total resistance of the CAN Bus networks should be measured with the battery, and auxiliary battery (if equipped with Engine Stop/Start), disconnected. The normal average CAN Bus resistance is approximately 60 Ohms. The termination resistors are integral to the Star Connectors.

TESTING WITH THE MOPARB® DIAGNOSTIC STAR CONNECTOR KIT AND MOPARB® SCOPE

NOTE: The Scan Tool Topology may not correctly display the CAN Bus module layout yet should still be used when diagnosing a CAN Bus network with Star Connectors. Wording on the PowerNet / CUSW CAN BUS Diagnostic Tool shows "STAR BLOCK" instead of "STAR CONNECTOR".

The Star Connector locations **must** be determined before proceeding to diagnose the CAN Bus. To help determine the flow of the CAN Bus network, use the Wiring Diagrams, Component Views, Connector End Views and the Star Connector terminal information on the back-side of the (special tool #2073400080, Kit, PowerNet / CUSW CAN BUS Diagnostic Tool).

NOTE: For best results, allow the network and scan tool to update before opening or closing other switches.



BASIC POWERNET / CUSW CAN BUS EXAMPLE

IDENTIFICATION	DESCRIPTION
RED STAR	STAR CONNECTOR
A	3-Pin STAR CONNECTOR POWERNET / CUSW CAN BUS DIAGNOSTIC TOOL
B	2-Pin ECU POWERNET / CUSW CAN BUS DIAGNOSTIC TOOL

CAN BUS DIAGNOSTIC TOOL STRATEGIES

- There are several strategies for testing the Powernet / CUSW CAN Bus when multiple modules will not communicate with CAN C or IHS. Understanding the strategies below, along with the above 2-Pin and 3-Pin CAN Bus Diagnostic Tool descriptions, will help with diagnosing a CAN Bus equipped with one or more Star Connectors.
- The testing tools ports are configured to the CAN C and IHS Bus (+) and (-) circuits and can be used to read CAN Bus measurements with a DVOM or analyze waveform patterns with an Oscilloscope. For best results, allow the network and scan tool to update before opening or closing other switches.

FAULTY ECU CONNECTED

- When the toggle switch is in the **"CONNECTED"** position, the Powernet / CUSW CAN Bus Diagnostic Tool is a pass-through for CAN communication.



NOTE: **Wording on the PowerNet / CUSW CAN BUS Diagnostic Tool shows "STAR BLOCK" instead of "STAR CONNECTOR". Steps with an asterisk (*) indicates additional testing capabilities with a DVOM / Oscilloscope.**

TWO STAR CONNECTOR CAN BUS

1. With the ignition ON, view the scan tool topology screen and note any module(s) in Red.
2. Using the Bus Topology Locations in Wiring Diagrams, locate the single Star Connector closest to the module(s) in Red.
3. Using the Location Views in the Wiring Diagrams, locate the Star Connector on the vehicle where the Powernet / CUSW CAN Bus Diagnostic Tool will be connected.
4. Using the Connector End Views in Wiring Diagrams, determine the CAN Bus circuits to be tested.
5. Using the Connector End Views in Wiring Diagrams, match the CAN Bus connector terminals with the Star Connector terminal information on the back-side of the Powernet / CUSW CAN Bus Diagnostic Tool.
6. According to the Basic Powernet / CUSW CAN Bus image example shown above, disconnect the 2-Pin connector of the suspect ECU from the Star Connector.
7. Connect the 2-Pin CAN Bus Diagnostic Tool to the Star Connector in place of the suspect ECU.
8. * Connect the suspect ECU to the 2-Pin CAN Bus Diagnostic Tool. *
9. * Toggle the switch on the 2-Pin CAN Bus Diagnostic Tool from **DISCONNECT** to **CONNECTED** . *
10. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *
11. * Toggle the switch on the 2-Pin CAN Bus Diagnostic Tool from **CONNECTED** to **DISCONNECT** . *
12. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *
13. * Check the CAN bus wiring for shorts or opens and repair or replace as needed. If no trouble found proceed to the next step. *
14. If applicable, replace the ECU when disconnected from the CAN which allowed the CAN bus activity status to return to normal communication. If not applicable, proceed to the next step.
15. If the CAN bus activity does not return to normal communication, repeat steps 1 through 13 to all ECUs connected to the Star Connector before proceeding to the next step.
16. If the CAN bus activity does not return to normal communication, after testing all ECUs connected to the Star Connector proceed to the testing below for a **FAULTY STAR CONNECTOR** .

ONE STAR CONNECTOR CAN BUS

1. With the ignition ON, view the scan tool topology screen and note any module(s) in Red.
2. Using the Bus Topology Locations in Wiring Diagrams, locate the single Star Connector closest to the module(s) in Red.
3. Using the Location Views in the Wiring Diagrams, locate the Star Connector on the vehicle where the Powernet / CUSW CAN Bus Diagnostic Tool will be connected.
4. Using the Connector End Views in Wiring Diagrams, determine the CAN Bus circuits to be tested.
5. Using the Connector End Views in Wiring Diagrams, match the CAN Bus connector terminals with the Star Connector terminal information on the back-side of the Powernet / CUSW CAN Bus Diagnostic Tool.
6. According to the Basic Powernet / CUSW CAN Bus image example shown above, disconnect the 2-Pin connector of the suspect ECU from the Star Connector.
7. Connect the 2-Pin CAN Bus Diagnostic Tool to the Star Connector in place of the suspect ECU.
8. * Connect the suspect ECU to the 2-Pin CAN Bus Diagnostic Tool. *
9. * Toggle the switch on the 2-Pin CAN Bus Diagnostic Tool from **DISCONNECT** to **CONNECTED** . *
10. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *
11. * Toggle the switch on the 2-Pin CAN Bus Diagnostic Tool from **CONNECTED** to **DISCONNECT** . *
12. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *

13. * Check the CAN bus wiring for shorts or opens and repair or replace as needed. If no trouble found proceed to the next step. *
14. If applicable, replace the ECU when disconnected from the CAN which allowed the CAN bus activity status to return to normal communication. If not applicable, proceed to the next step.
15. If the CAN bus activity does not return to normal communication, repeat steps 1 through 13 to all ECUs connected to the Star Connector before proceeding to the next step.
16. If the CAN bus activity does not return to normal communication, after testing all ECUs connected to the Star Connector - replace Star Connector.

FAULTY STAR CONNECTOR

- When a switch is toggled in the **"CONNECTED"** position, the Powernet / CUSW CAN Bus Diagnostic Tool is a pass-through for CAN communication.



NOTE: Wording on the PowerNet / CUSW CAN BUS Diagnostic Tool shows "STAR BLOCK" instead of "STAR CONNECTOR". Steps with an asterisk (*) indicates additional testing capabilities with a DVOM / Oscilloscope.

TWO STAR CONNECTOR CAN BUS

1. With the ignition ON, view the scan tool topology screen and note any module(s) in Red.
2. Using the Bus Topology Locations in Wiring Diagrams, locate the single Star Connector closest to the module(s) in Red.
3. Using the Location Views in the Wiring Diagrams, locate the Star Connector on the vehicle where the Powernet / CUSW CAN Bus Diagnostic Tool will be connected.
4. Using the Connector End Views in Wiring Diagrams, determine the CAN Bus circuits to be tested.
5. Using the Connector End Views in Wiring Diagrams, match the CAN Bus connector terminals with the Star Connector terminal information on the back-side of the Powernet / CUSW CAN Bus Diagnostic Tool.
6. According to the Basic Powernet / CUSW CAN Bus image example shown above, disconnect the 3-Pin connector of the Star Connector that is the furthest from the Gateway.
7. Connect the 3-Pin CAN Bus Diagnostic Tool to the vehicle harness side in place of the suspect Star Connector.
8. * Connect the suspect Star Connector to the 3-Pin CAN Bus Diagnostic Tool. *

NOTE: Do NOT have both toggle switches in the **DISCONNECT** position, as this will change the resistance of the tool from 120 Ohms to 60 Ohms resistance, and hinder CAN communication.

9. * Toggle the switch on the 3-Pin CAN Bus Diagnostic Tool from **DISCONNECT** to **CONNECTED** . *
10. * It may be needed to toggle the switch on the 3-Pin CAN Bus Diagnostic Tool from **CONNECTED** to **DISCONNECT** . *
11. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *
12. * Check the CAN bus wiring for shorts or opens and repair or replace as needed. If no trouble found proceed to the next step. *
13. If the CAN bus activity does not return to normal communication, after testing the Star Connector - replace Star Connector.

ONE STAR CONNECTOR CAN BUS

1. With the ignition ON, view the scan tool topology screen and note any module(s) in Red.
2. Using the Bus Topology Locations in Wiring Diagrams, locate the single Star Connector closest to the module(s) in Red.
3. Using the Location Views in the Wiring Diagrams, locate the Star Connector on the vehicle where the Powernet / CUSW CAN Bus Diagnostic Tool will be connected.
4. Using the Connector End Views in Wiring Diagrams, determine the CAN Bus circuits to be tested.
5. Using the Connector End Views in Wiring Diagrams, match the CAN Bus connector terminals with the Star Connector terminal information on the back-side of the Powernet / CUSW CAN Bus Diagnostic Tool.
6. According to the Basic Powernet / CUSW CAN Bus image example shown above, disconnect the 2-Pin connector of the suspect ECU from the Star Connector.
7. Connect the 2-Pin CAN Bus Diagnostic Tool to the Star Connector in place of the suspect ECU.
8. * Connect the suspect ECU to the 2-Pin CAN Bus Diagnostic Tool. *
9. * Toggle the switch on the 2-Pin CAN Bus Diagnostic Tool from **DISCONNECT** to **CONNECTED** . *
10. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *
11. * Toggle the switch on the 2-Pin CAN Bus Diagnostic Tool from **CONNECTED** to **DISCONNECT** . *
12. * Check the CAN bus activity status of the suspect ECU with the diagnostic scan tool. *
13. * Check the CAN bus wiring for shorts or opens and repair or replace as needed. If no trouble found proceed to the next step. *
14. If applicable, replace the ECU when disconnected from the CAN which allowed the CAN bus activity status to return to normal communication. If not applicable, proceed to the next step.
15. If the CAN bus activity does not return to normal communication, repeat steps 1 through 13 to all ECUs connected to the Star Connector before proceeding to the next step.
16. If the CAN bus activity does not return to normal communication, after testing all ECUs connected to the Star Connector - replace Star Connector.

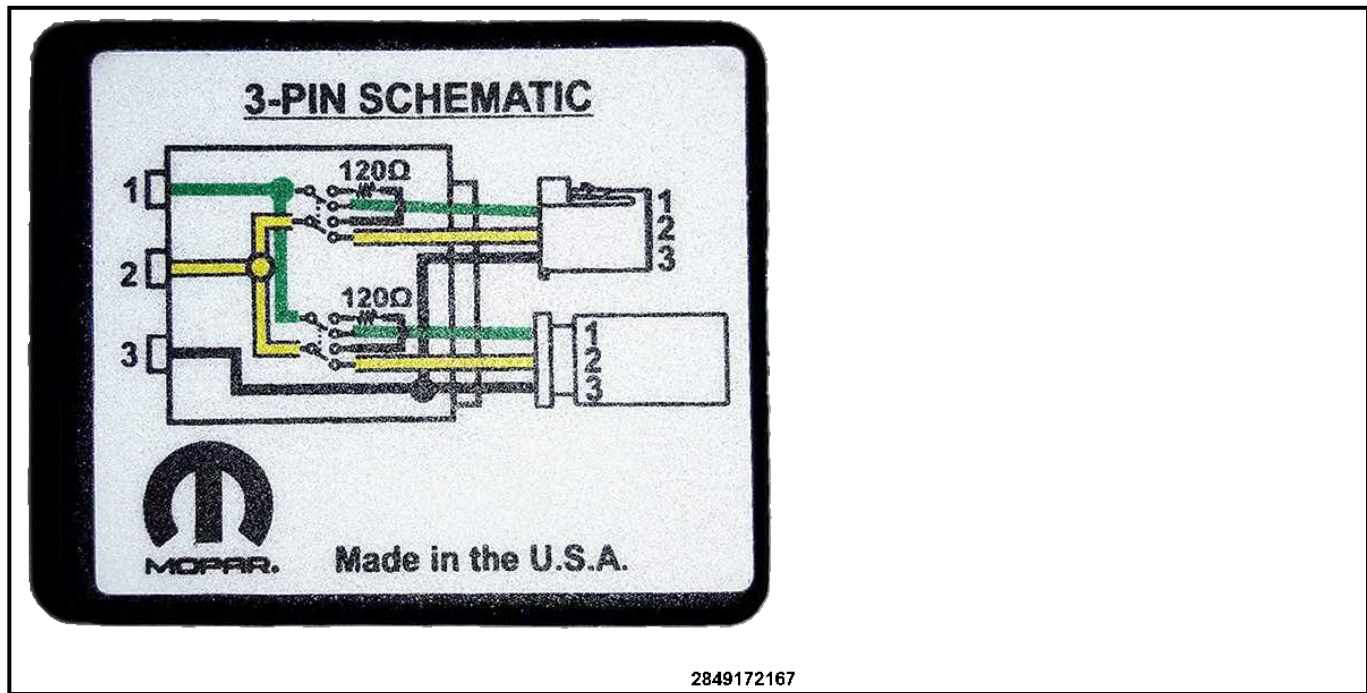
DVOM / OSCILLOSCOPE TESTING ANALYSIS

- Disconnecting and Connecting the switches on the 3-Pin Powernet / CUSW CAN Bus Diagnostic Tools can be used when measuring the voltage and resistance on the CAN Bus circuits. Use the Wiring Diagrams and the Star Connector terminal information on the back-side of the Powernet / CUSW CAN Bus Diagnostic Tools, to further analyze and determine if a module or CAN Bus circuit within the Star Connector being used for testing is the cause of the CAN Bus failure.

The 3-Pin resistance table below shows the resistance values the 3-pin CAN Bus diagnostic tool will add to the CAN being tested.

3-PIN RESISTANCE TABLE

SWITCH - TO STAR BLOCK	SWITCH - HARNESS TO OTHER STAR BLOCK	APPROXIMATE RESISTANCE WHEN MEASURED WITH DVOM
CONNECTED	CONNECTED	OL (OUT OF LIMIT) / PASS THROUGH FOR VEHICLE CAN
CONNECTED	DISCONNECTED	120
DISCONNECTED	CONNECTED	120
DISCONNECTED	DISCONNECTED	60 (BOTH SWITCHES IN PARALLEL)



Perform the following steps to measure and record the voltage and resistance values of CAN Bus circuits using a DVOM or Oscilloscope:

1. Using the Powernet / CUSW CAN Bus Diagnostic Tools determine the **DISCONNECT** to **CONNECTED** flow of the CAN Bus network before proceeding.
2. With the ignition ON, use a DVOM /Oscilloscope to measure and record the **voltage** on the CAN Bus (+) circuit at connection port **1** of the Powernet / CUSW CAN Bus Diagnostic Tool. Connect the ground lead from the DVOM /Oscilloscope to connection port **3** on the Powernet / CUSW CAN Bus Diagnostic Tool.
3. With the ignition ON, use a DVOM /Oscilloscope to measure and record the **voltage** on the CAN Bus (-) circuit at connection port **2** of the Powernet / CUSW CAN Bus Diagnostic Tool. Connect the ground lead from the DVOM /Oscilloscope to connection port **3** on the Powernet / CUSW CAN Bus Diagnostic Tool.
4. With the battery and auxiliary battery (if equipped with Engine Stop/Start) disconnected, use a DVOM/Oscilloscope to measure and record the **resistance** on the CAN Bus (+) and (-) circuits at the Powernet / CUSW CAN Bus Diagnostic Tool ports **1** and **2**.
5. Compare the recorded CAN Bus voltage measurements with the above CAN Bus Voltages (Normal Operation) table. For additional information, refer to the appropriate CAN Bus circuit failure below:
 - **CAN Bus (+) or (-) Circuit Open:** The measurements with the incorrect voltage and less than 120.0 Ohms of resistance indicates which CAN Bus circuit is open, along with the direction of where the CAN Bus circuit is open.
 - **CAN Bus (+) or (-) Circuit Short To Ground:** The measurements with the incorrect voltage and the least amount of resistance indicates which CAN Bus circuit is shorted to ground, along with the direction of where the CAN Bus circuit is shorted.

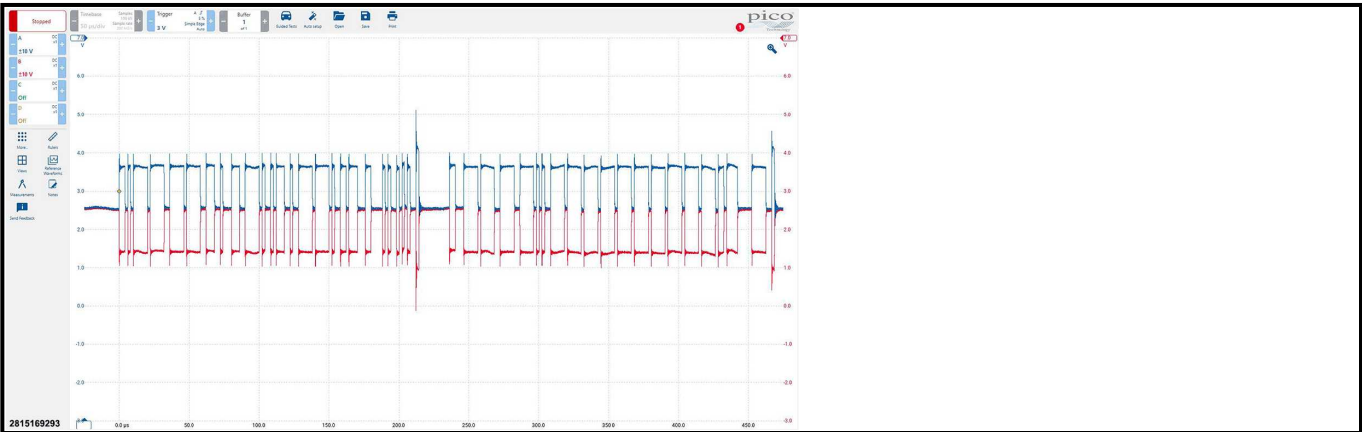
- **CAN Bus (+) or (-) Circuit Short To Voltage:** The measurements with the incorrect voltage indicates which CAN Bus circuit is shorted to voltage, along with the direction of where the CAN Bus circuit is shorted.
- **CAN Bus (+) or (-) Circuits Shorted Together:** The measurements with equal voltage and the least amount of resistance indicates the direction of where the CAN Bus circuits are shorted together.

A NORMAL CAN Bus OSCILLOSCOPE WAVEFORM

Mopar Scope Settings

DESCRIPTION	MEASUREMENT
CHANNEL A	10 volts
CHANNEL B	10 volts
TIME BASE	50 μ s/div [microseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL

NOTE: The Mopar Scope has preset Guided Tests for Communications testing of the CAN.



SCAN TOOL WILL NOT COMMUNICATE WITH CAN BUS

NOTE: This procedure diagnoses CAN Bus circuits after the Security Gateway (SGW) Module.

NOTE: If the vehicle operates, but the scan tool topology screen indicates all modules on a CAN Bus do not communicate, proceed to **SCAN TOOL DOES NOT COMMUNICATE WITH VEHICLE**. Refer to [DIAGNOSIS AND TESTING](#).

NOTE: Due to the loss of communication on the CAN Bus, multiple modules may not communicate on the network and certain U-code DTCs, such as CAN BUS OFF, CAN BUS MISSING MESSAGE or CAN BUS NO SIGNAL, may not be displayed on the scan tool until the cause of the fault is repaired.

If the vehicle **does not** operate properly and the scan tool topology screen indicates modules on a CAN Bus do not communicate, **perform** the appropriate Body Control Module (BCM) CAN BUS OFF, CAN BUS MISSING MESSAGE or CAN BUS NO SIGNAL U-code diagnostic procedure for the CAN Bus being diagnosed. Refer to [DIAGNOSIS AND TESTING](#) .

SCAN TOOL WILL NOT COMMUNICATE WITH VEHICLE

THEORY OF OPERATION

Below are a few different ways communication on a vehicle takes place:

1. Scan tool to the Gateway Module

2. ECU to ECU
3. ECU to Device
4. Device to ECU

Communication to the vehicle is established with a scan tool, through the Data Link Connector (DLC) to a Gateway ECU over the Controller Area Network (CAN) Bus. On this vehicle the Security Gateway (SGW) Module communicates with the scan tool through the CAN-C and CAN-IHS Bus networks.

The CAN Bus architecture of this vehicle operates in a "hub" or "star" style, meaning all of the ECUs are connected at a central point in the Star Connectors. The terminating resistors for CAN Bus are located in the Star Connectors and are a part of the body and instrument panel wiring harnesses.

In other CAN Bus architectures a vehicle may operate in a "stub" or "backbone" style, meaning there is a single, main line that connects all ECUs. The terminating resistors for a CAN Bus in the "stub" or "backbone" style are located in 2 separate dominant ECUs and are placed as far apart in the vehicle, as is physically possible.

The header of the scan tool is populated by the BCM with vehicle data, when communication with the scan tool has been established through the SGW Module. The scan tool becomes another ECU on the vehicle's networks by acting as the primary controlling ECU of all Bus networks while connected to the DLC, and contributes voltage to the operation of the CAN Bus.

CAN BUS OPERATIONAL VOLTAGES

CAN C Bus Operational Voltages								
CAN C Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

CAN IHS Bus Operational Voltages							
CAN IHS Circuits	Key-Off (Bus Asleep)	Key-On (Bus Active)	CAN (-) Short to Ground	CAN (+) Short to Ground	CAN (-) Short to Voltage	CAN (+) Short to Voltage	CAN (+) Short to CAN (-)
CAN (-)	0.0 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN (+)	0.0 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

Notes

All measurements were taken between a ECU ground and a CAN Bus terminal, using a standard DVOM. The DVOM will display the average network voltage.

Total resistance of the CAN Bus networks should be measured with the battery, and auxiliary battery (if equipped with Engine Stop/Start), disconnected. The normal average CAN Bus resistance is approximately 60 Ohms. The termination resistors are integral to the Star Connectors.

WHEN MONITORED AND SET CONDITIONS

NOTE: This procedure diagnoses the CAN Bus circuits between the Data Link Connector (DLC) and the Security Gateway (SGW) Module.

NOTE: For the CAN C Bus, if the scan tool is able to communicate with the SGW Module, but does not communicate with other CAN C Bus modules, perform the appropriate Body Control Module (BCM) CAN BUS OFF, CAN BUS MISSING MESSAGE or CAN BUS NO SIGNAL U-code diagnostic procedure for the CAN C Bus. Refer to [DIAGNOSIS AND TESTING](#) .

NOTE: This condition will not display any Diagnostic Trouble Codes (DTCs).

CAN C Bus Off Symptoms:

- The ignition turns on and the engine starts.
- The scan tool does not automatically detect the vehicle and the Vehicle Identification Number (VIN) has to be manually entered. (**Exception:** CAN C (-) circuit is shorted to ground.)
- The scan tool displays a Security Gateway (SGW) Module is unresponsive message. (**Exception:** CAN C (-) circuit is shorted to ground.)
- The scan tool topology screen indicates all CAN IHS Bus modules communicate, as intended.
- The scan tool topology screen indicates there is no communication with the SGW Module, all CAN C Bus modules, and possibly the Radio. (**Exception:** CAN C (-) circuit is shorted to ground.)
- If a CAN C (-) or (+) circuit is shorted to ground, the voltage on the circuit will measure 0.0 volts.

CAN IHS Bus Off Symptoms:

- The ignition turns on and the engine starts.
- The scan tool is able to communicate with the Security Gateway (SGW) Module and the Radio.
- The scan tool topology screen indicates all CAN C Bus modules communicate, as intended.
- The scan tool topology screen indicates there is no communication with all CAN IHS Bus modules. (**Exception:** CAN IHS (-) circuit is shorted to ground.)
- If a CAN IHS (-) or (+) circuit is shorted to ground, the voltage on the circuit will measure 0.0 volts.

CAN C Bus and CAN IHS Bus Off Symptoms:

If the scan tool is unable to communicate with **All** CAN C Bus and CAN IHS Bus modules, check the following:

- Scan tool not operating properly.
- DLC power and ground circuits.
- SGW Module power and ground circuits.

Possible Causes
INOPERATIVE SCAN TOOL
POOR TERMINAL CONTACT OR CONNECTOR CONNECTION(S)
DATA LINK CONNECTOR (DLC)
DATA LINK CONNECTOR FUSED B (+) CIRCUIT OPEN OR HIGH RESISTANCE
DATA LINK CONNECTOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CAN C (+) BUS CIRCUIT OPEN, SHORTED OR HIGH RESISTANCE
CAN C (-) BUS CIRCUIT OPEN, SHORTED OR HIGH RESISTANCE
CAN IHS (+) BUS CIRCUIT OPEN, SHORTED OR HIGH RESISTANCE
CAN IHS (-) BUS CIRCUIT OPEN, SHORTED OR HIGH RESISTANCE
CAN C (+) AND (-) BUS CIRCUITS SHORTED TOGETHER
CAN IHS (+) AND (-) BUS CIRCUITS SHORTED TOGETHER

DIAGNOSTIC TEST**1. CHECK THE SCAN TOOL FOR PROPER OPERATION**

1. Verify the scan tool can communicate with another vehicle.

Does the scan tool communicate with another vehicle?

Yes

- Go To [2](#)

No

- Contact the scan tool support.

2. CHECK THE DATA LINK CONNECTOR (DLC) AND TERMINALS FOR DAMAGE

1. For complete communication wiring at the Data Link connector, **Refer to the appropriate wiring information**
2. Verify all terminals in the DLC are locked into place and there is no damage to the connector or terminals.

Are all terminals in the DLC locked into place and no damage found to the connector or terminals?

Yes

- Go To [3](#)

No

- Repair the DLC and terminals as needed. Once the repair is complete, check the communication between the scan tool and this vehicle.

3. CHECK THE DLC (B+) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

NOTE: **Connect a battery charger to the vehicle in accordance with Service Information to maintain a full state of charge throughout testing on this vehicle.**

1. Connect the (special tool #CH7002, Break Out Box, J1962, 16-Way) to the DLC.

NOTE: **Do not connect the scan tool to the Break Out Box.**

2. Measure the voltage on the DLC Fused (B+) circuit at the Break Out Box.

Is the voltage above 10.0 volts?

Yes

- Go To [4](#)

No

- Using the wiring diagrams as a guide, Inspect for an open fuse. If the fuse is open, check the DLC Fused (B+) circuit for a short to ground and repair, if needed. If the fuse is OK, repair the DLC Fused (B+) circuit for an open or high resistance.

4. CHECK THE DLC GROUND CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. Measure the resistance of the DLC Ground circuits between ground and the Breakout Box.

Is the resistance above 3.0 Ohms?

Yes

- Repair the DLC Ground circuit for an open or high resistance.

No

- Go To [5](#)

5. CHECK THE CAN C BUS (+) AND (-) CIRCUITS FOR PROPER VOLTAGE

1. Measure the voltage on the CAN C Bus (+) circuit at the Breakout Box and note the results.
2. Measure the voltage on the CAN C Bus (-) circuit at the Breakout Box and note the results.
3. Compare the results to the above NORMAL CAN CIRCUIT VOLTAGE TABLE.

Are the CAN C Bus (+) and (-) circuit voltages within the specified values?

Yes

- Go To [6](#)

No

- **Voltage below the specified value:** Go To [7](#)
- **Voltage above the specified value:** Repair the short to voltage in the CAN C Bus circuit(s), between the DLC and the SGW Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK THE CAN IHS BUS (+) AND (-) CIRCUITS FOR PROPER VOLTAGE

1. Measure the voltage on the CAN IHS Bus (+) circuit at the Breakout Box and note the results.
2. Measure the voltage on the CAN IHS Bus (-) circuit at the Breakout Box and note the results.
3. Compare the results to the above NORMAL CAN CIRCUIT VOLTAGE TABLE.

Are the CAN IHS Bus (+) and (-) circuit voltages within the specified values?

Yes

- Contact scan tool support.

No

- **Voltage below the specified value:** Go To [7](#)
- **Voltage above the specified value:** Repair the short to voltage in the CAN IHS Bus circuit(s), between the DLC and the SGW Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. CHECK THE SGW MODULE FUSED B(+) AND FUSED IGNITION CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the SGW Module C1 and C2 harness connectors.
3. Measure the voltage on the SGW Module Fused B(+) circuit at the SGW Module C2 harness connector, terminal 5.
4. Turn the ignition on.
5. Measure the voltage on the SGW Module Fused Ignition circuit at the SGW Module C1 harness connector, terminal 7.

Is the voltage above 10.0 volts for the Fused B(+) circuit and Fused Ignition circuit?

Yes

- Go To [8](#)

No

- Repair the Fused B (+) circuit or Fused Ignition circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. CHECK THE SGW MODULE GROUND CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the SGW Module Ground circuit at SGW Module C1 harness connector, terminal 6.
3. Measure the resistance between ground and the SGW Module Ground circuit at SGW Module C2 harness connector, terminal 4.

Is the resistance above 3.0 Ohms on one or both Ground circuits?

Yes

- Repair the Ground circuit(s) for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [9](#)

9. CHECK THE CAN C BUS AND CAN IHS BUS CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. Measure the resistance of the CAN C Bus (+) circuit between the Breakout Box and the SGW Module C1 harness connector, terminal 3.
2. Measure the resistance of the CAN C Bus (-) circuit between the Breakout Box and the SGW Module C1 harness connector, terminal 10.
3. Measure the resistance of the CAN IHS Bus (+) circuit between the Breakout Box and the SGW Module C2 harness connector, terminal 2.
4. Measure the resistance of the CAN IHS Bus (-) circuit between the Breakout Box and the SGW Module C2 harness connector, terminal 7.

Is the resistance above 3.0 Ohms for any of the CAN Bus circuits?

Yes

- Check the CAN Bus wiring and electrical connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension and repair as necessary. If no problems are found, repair the open or high resistance in the CAN Bus circuit(s), between the DLC and the SGW Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [10](#)

10. CHECK THE CAN C BUS AND CAN IHS BUS CIRCUITS FOR A SHORT TO GROUND

1. Check for continuity between ground and the CAN C Bus (+) circuit at SGW Module C1 harness connector, terminal 3.

2. Check for continuity between ground and the CAN C Bus (-) circuit at SGW Module C1 harness connector, terminal 10.
3. Check for continuity between ground and the CAN IHS Bus (+) circuit at SGW Module C2 harness connector, terminal 2.
4. Check for continuity between ground and the CAN IHS Bus (-) circuit at SGW Module C2 harness connector, terminal 7.

Is there continuity between ground and any of the CAN Bus circuits?

Yes

- Repair the short to ground in the CAN Bus circuit(s), between the DLC and the SGW Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [11](#)

11. CHECK THE CAN C BUS CIRCUITS FOR A SHORT TOGETHER

1. Check for continuity between the CAN C Bus (+) circuit and the CAN C Bus (-) circuit at SGW Module C1 harness connector, terminals 3 and 10.

Is there continuity between the CAN C Bus (+) circuit and the CAN C Bus (-) circuit?

Yes

- Repair the short between the CAN C Bus (+) and (-) circuits, between the DLC and the SGW Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [12](#)

12. CHECK THE CAN IHS BUS CIRCUITS FOR A SHORT TOGETHER

1. Check for continuity between the CAN IHS Bus (+) circuit and the CAN IHS Bus (-) circuit at SGW Module C2 harness connector, terminals 2 and 7.

Is there continuity between the CAN IHS Bus (+) circuit and the CAN IHS Bus (-) circuit?

Yes

- Repair the short between the CAN IHS Bus (+) and (-) circuits, between the DLC and the SGW Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [13](#)

13. CHECK RELATED SGW MODULE HARNESS CONNECTIONS

1. Disconnect all SGW Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SGW Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase any DTCs.
9. With the scan tool, attempt to communicate with the SGW Module.

Is the SGW active on all of the CAN buses connected to the ECU?

NOTE: Choose the one answer that best describes the vehicle condition that exists.

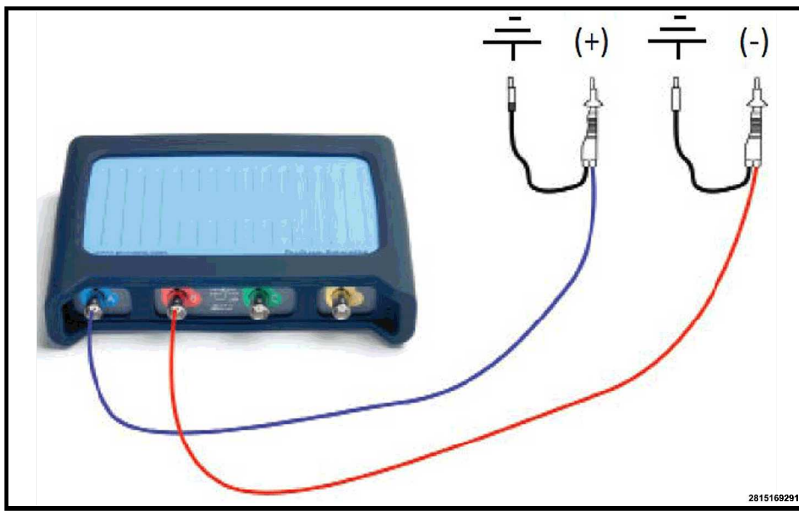
Yes - The SGW is active on all of the CAN buses connected to the ECU without any history of this concern.

- The wiring or poor connection problem has been repaired.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Go To [14](#)

14. CHECK ALL CAN BUS COMMUNICATION CIRCUITS FROM THE DLC TO THE SGW WITH THE MOPAR SCOPE

NOTE: Some vehicles can have multiple CAN connections within a connector, make sure that you are testing the same CAN for both circuits.

Connect the black pin for each test lead to Chassis ground. Connect the blue lead to CAN (+) and the red lead to CAN (-) for the circuits to be tested.



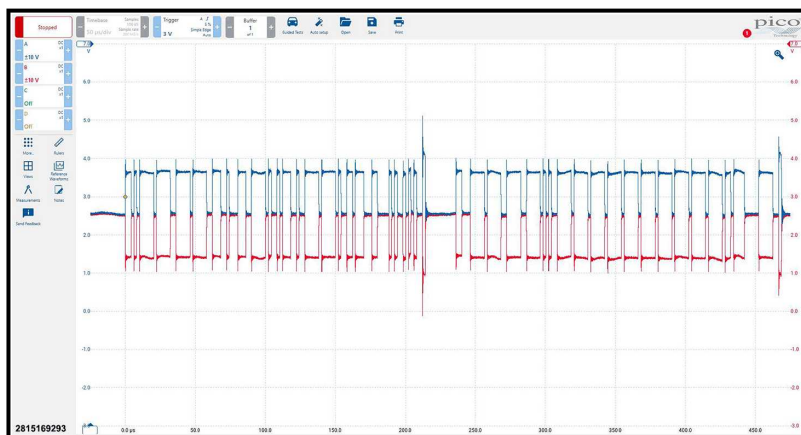
1. Start the Mopar Scope.
2. Once the Mopar Scope is running, select **Guided Tests** .
3. Select **Communications** .
4. Select **CAN L&H** .
5. Select **CAN bus testing / diagnostics** .
6. Select **Load settings file** .
7. Turn the ignition on.

NOTE: When connected to the vehicle harness correctly, the LEDs on the breakout box will light up to indicate that there is activity on the bus.

8. A waveform should appear.

The image below is of a normal CAN bus waveform using the Mopar Scope. The waveform should reveal that data is being exchanged continuously along the CAN bus and the peak voltages are correct.

DESCRIPTION	MEASUREMENT
CHANNEL A	10 volts
CHANNEL B	10 volts
TIME BASE	50 μ s/div [microseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL



9. With the Mopar Scope running, use the wiring diagrams as a guide to trace the circuits and look for any in-line connectors where the fault could occur intermittently by wiggling **ALL related** wire harness and connectors.

Did the Mopar Scope show the CAN bus waveform fault?

Yes

- Repair any conditions that are found.
- Replace the Security Gateway (SGW) Module in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

CHECKING CAN-C BUS USING MOPAR SCOPE

THEORY OF OPERATION CAN-C

1. CHARACTERISTICS OF CAN-C

1. CAN-C is a multiplexed network that allow all modules to share information using high speed data signals. These networks use a twisted pair of insulated copper wires for the data bus. One wire is designated as CAN (+), the other is CAN (-). Connectors house the bus network circuit terminals in adjacent cavities and connect them to a module. The connectors also connect certain branches of wiring in-line along the wiring harness. A gateway module is used to link CAN-C to other communication networks.

The number of modules placed on a CAN-C bus is limited. In these instances, the modules are organized by interior and exterior location on the vehicle, and placed on different bus networks.

2. CAN MESSAGE CONTENT, ARBITRATION, AND TERMINATION

1. The CAN network is the most common vehicle communication network and is quickly becoming the industry standard. While other communication network protocols do exist, we will focus on the details of the CAN vehicle communication protocol. Knowledge of the CAN protocol is crucial because every late model FCA vehicle currently uses some form of CAN-based communication network.

A characteristic with CAN communication networks is that each module can bias the network. This means each module can alter the voltage level of the network, both on CAN (+) and CAN (-). Modules transmit information by biasing the network, and receive information by measuring the changing bias.

Information is shared over a CAN network using a sequence of controlled voltage pulses sent out on the bus wires. At the proper time, a module biases the bus voltage to transmit a data signal. It does so with a sequence of voltage pulses that vary in frequency. The combination of these voltage pulses forms a data message and is called a data frame. By design, CAN modules will recognize certain frequency voltage pulses at specific times. The sequence of voltage pulses that form a data frame can be broken down into specific parts.

Start of frame (SOF) - The transmission of data begins with the sending module biasing the bus dominant from a recessive state.
Arbitration Field - The sending module identifies itself, and is prioritized; modules that require data from the sending module are alerted.
Control Field - Identifies the format and bit construction of a message.
Data Field - The actual data or information is contained within this field. The DLC (Data Length Code) in Classic CAN uses 0-8 bytes.
Cyclical redundancy check (CRC) - A redundant check that verifies the message was received correctly.
Acknowledgement (ACK) - Receiving modules verify if they successfully received the intended information.
End of frame (EOF) - The bus returns to a recessive state, signaling the end of the transfer of data. There are two frame formats used in classic CAN:

- CAN base format - 11 bit identifier and fixed bit rate.
- CAN extended format - 29 bit identifier and fixed bit rate.

3. ARBITRATION

1. When multiple modules are connected to a single communication network, there is a potential that two modules could attempt to transmit data on to the network at the same time. To prevent this from occurring, modules that are considered more important will have priority when attempting to transmit data. The less important modules are signaled to wait until all other data transfers are complete. This process is called arbitration. When normal operation occurs, arbitration prevents modules from disrupting the network. If a module fails and ceases to adhere to this arbitration, faults could occur on the communication network.

4. THEORY AND OPERATION OF CAN-C

1. Each CAN-C module can bias the network. This means the module will determine the voltage, and change in voltage, transmitted on the bus wires. Keep in mind there are many modules wired into the CAN-C or FD networks. Arbitration allows for all modules to share information in an orderly manner. Modules with messages deemed highly important take priority.

5. TERMINATION RESISTANCE

1. The CAN-C network has terminating resistors wired parallel in the circuit. Termination resistance allows for CAN (+) and CAN (-) circuit voltages to pull in different directions as well as absorb any stray voltage spikes throughout the network, preventing network signal interference. Optimal CAN-C bus termination resistance is 60 ohms. In some CAN architectures (Stub, Hub, or Daisy-Chain), this is achieved using two 120-ohm resistors located inside dominant network modules or Star Connectors if equipped. Certain vehicles may contain non-dominant modules with internal resistance, typically around 2.8- 3.0 kilo-ohms, but this resistance is part of the modules' data transmit/receive processor, and is not used to stabilize the network. A non-dominant module with this resistance will have an effect on the total network resistance when measured with a Multi Meter.

Understanding the fault characteristics of the CAN-C bus is key to identifying where to begin diagnosis. Diagnostic strategies are different between concerns of one module experiencing a communication fault versus a fault that affects the entire network. Using techniques like unplugging in-line connectors to break the CAN-C circuit in half and taking voltage and resistance measurements will quickly isolate a communication network fault.

6. TOLERANCE

1. CAN-C has limited fault tolerance. The majority of faults result in a complete loss of communication with the CAN-C network. One of the first steps in proper diagnosis is identifying whether a CAN-C fault is present. The symptoms of a CAN-C communication network fault are not unique. Lost time and improper repairs may result if the concern is not properly verified and identified. Whenever a CAN-C communication network fault is suspected, the first step is to connect the scan tool and check for network communication and U-codes.

7. FAULT SYMPTOMS AND DIAGNOSIS

1. When communication hard faults occur on the CAN-C bus circuits, such as a short to ground or short to power, typically the vehicle will experience a no crank/no start with the MIL illuminated. U-codes may be found in any of the modules on the bus. Check power, ground, the connector, and both bus circuits to the suspect module before replacing the module. If communication on an entire network or networks is not possible, ensure the scan tool is functioning properly and operating with the latest software level.

There are several faults that can interrupt normal operation of the CAN-C communication network. The network wire may chafe, resulting in one or both wires shorting to chassis ground, shorting to power, or shorting to each other. Damage to a connector can result in the same faults. If either CAN (+) or CAN (-) is shorted to ground, voltage, or together at any place in the circuit, communication is not possible. When an open occurs in the circuit, any module downstream of the open will not communicate. It is possible for a module to fail, resulting in loss of communication

with that particular module. If internally shorted, a module fault may bring the whole network down, resulting in no communication on the entire CAN-C network. If this type of concern occurs, typically the network will begin to communicate normally if the faulty module is disconnected. Remember to verify power and ground, as well as connector faults, before replacing any module.

8. CAN BUS FAULTS

1. There are five types of CAN Bus messaging faults, they are as follows:

TYPE	DESCRIPTION
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/sending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/sending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

9. CORRUPTION

1. A certain type of fault called corruption exhibits unique fault symptoms. One type of corruption occurs when an open on CAN (+), CAN (-), or both, separates a dominant module or Star Connector if equipped from the network. Removing the dominant module (or Star Connector if equipped) greatly affects the optimal termination resistance. Failed modules may produce network corruption. When a module that has termination fails, it may attempt to communicate (bias) on only CAN bus (+) or (-), causing corruption. Another type of corruption is caused by EMI due to stray, high-voltage magnetic fields or untwisted communication wires. When corruption occurs, communication may still be possible, but erratic. When viewed with a diagnostic scan tool, corruption causes the network modules to flash between yellow and red, indicating they are communicating one moment but not the next. If one particular module stays red (not communicating) and does not flash, suspect a concern with either this module, its connectors, or the bus circuits leading up to that module.

Electronic Control Units require the following four components to properly communicate on a Controller Area Network (CAN) data bus: Power (Battery/Fused B+/Ignition), Ground, CAN bus voltage and correct vehicle configuration.

If the message detected conflicts with the CRC the ECU receiving it will determine the message to be an error and consider that communication has not been possible. Diagnosis of this condition using the Mopar Scope may reveal activity that appears to be bus data messaging, even if no actual communication is possible. Communication problems that affect the whole bus, as a result of opens and terminal push outs are more likely to occur on data busses that operate at a high speed than a data bus that operates at a lower speed.

CAN Bus Voltages (Normal Operation)								
CAN-C Bus Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN-L Short to Ground	CAN-H Short to Ground	CAN-L Short to Battery	CAN-H Short to Battery	CAN-H Short to CAN-L
CAN-L (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V
Notes								
All measurements taken between node ground and CAN terminal with a standard DVOM. DVOM will display average network voltage. Total resistance of CAN-C network can also be measured (60 ohms).								

CAN BUS TERMINATION RESISTANCE TABLE											
NON-DOMINANT	0	1	2	3	4	5	6	7	8	9	10
ONE DOMINANT	120.00	115.38	111.11	107.14	103.44	100.00	96.77	93.75	90.90	88.23	85.71
TWO DOMINANT	60.00	58.82	57.69	57.60	55.55	54.54	53.57	52.63	51.73	50.84	50.00
NON-DOMINANT	11	12	13	14	15	16	17	18	19	20	
ONE DOMINANT	83.33	81.08	78.94	76.87	75.00	73.17	71.42	69.76	69.18	66.66	
TWO DOMINANT	49.18	48.38	47.61	46.87	46.15	45.45	44.77	44.11	43.47	42.85	

Possible Causes
DEALER INSTALLED EQUIPMENT
ECU POWER SUPPLY (FUSED B+/IGNITION) RELATED CIRCUIT(S) OPEN CIRCUIT, SHORTED TO GROUND OR ANOTHER CIRCUIT
ECU GROUND CIRCUIT(S) OPEN/HIGH RESISTANCE
ECU CAN BUS CIRCUIT(+/-) OPEN/HIGH RESISTANCE, SHORTED TO GROUND, TOGETHER, VOLTAGE, OR ANOTHER CIRCUIT
STAR CONNECTOR (IF EQUIPPED)
ECU

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

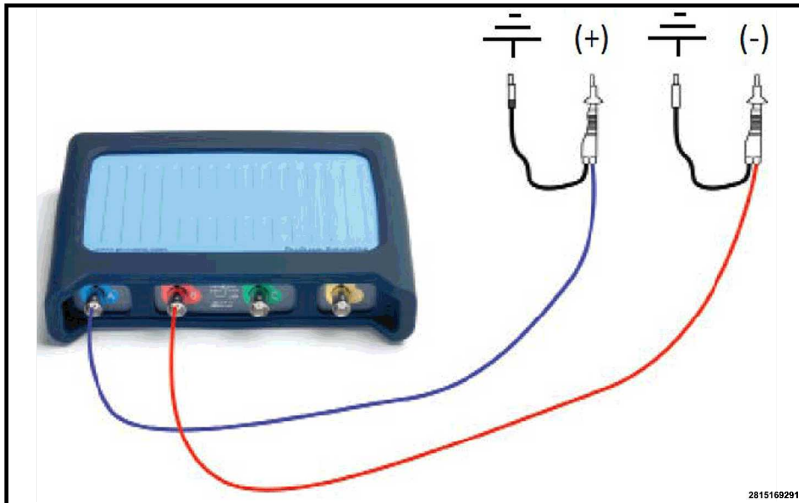
DIAGNOSTIC TEST

TESTING CAN BUS USING THE MOPAR SCOPE

NOTE: Some vehicles can have multiple CAN connections within a connector, make sure that you are testing the same CAN for both circuits.

For a complete CAN C BUS SYSTEM wiring diagram, Refer to the appropriate wiring information .

1. Connect the black pin for each test lead to Chassis ground. Connect the blue lead to CAN (+) and the red lead to CAN (-) for the circuits to be tested.



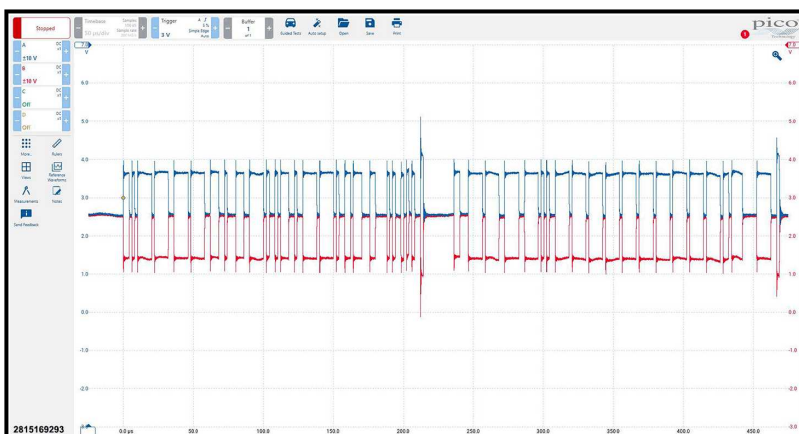
2. Start the Mopar Scope.
3. Turn the ignition on.

NOTE: When connected to the vehicle harness correctly, the LEDs on the breakout box will light up to indicate that there is activity on the bus.

4. A waveform should appear.

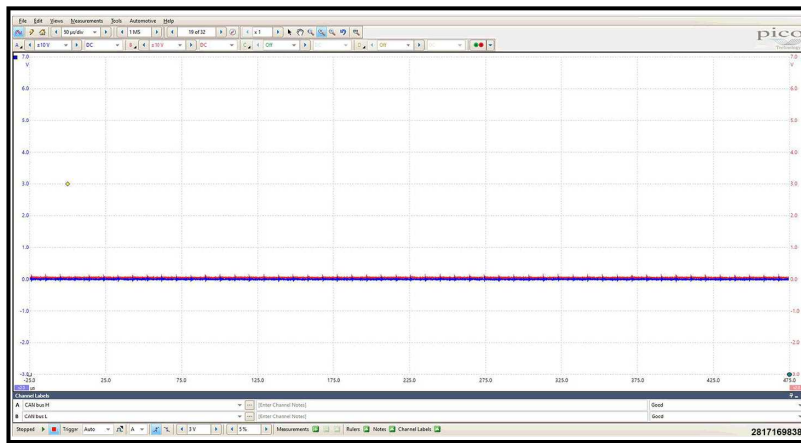
The image below is of a normal CAN bus waveform using the Mopar Scope.

DESCRIPTION	MEASUREMENT
CHANNEL A	10 volts
CHANNEL B	10 volts
TIME BASE	50 μ s/div [microseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL

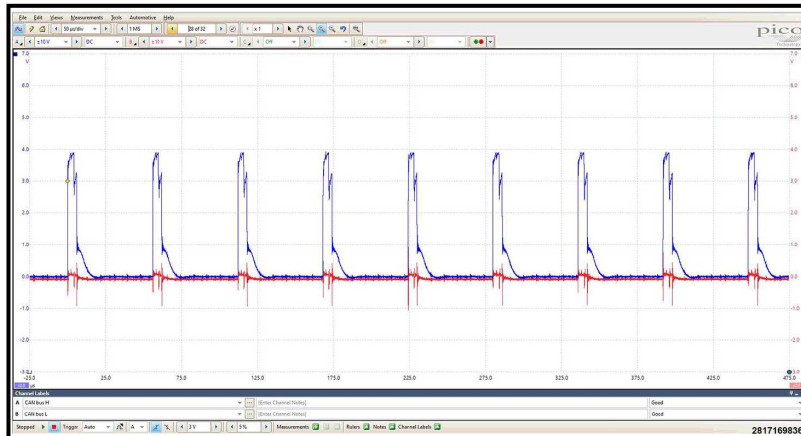


NOTE: The waveform should reveal that data is being exchanged continuously along the CAN bus and the peak voltages are correct.

5. Determine the type of CAN-C waveform fault the vehicle presently has from below:
 - (+) Short To Ground

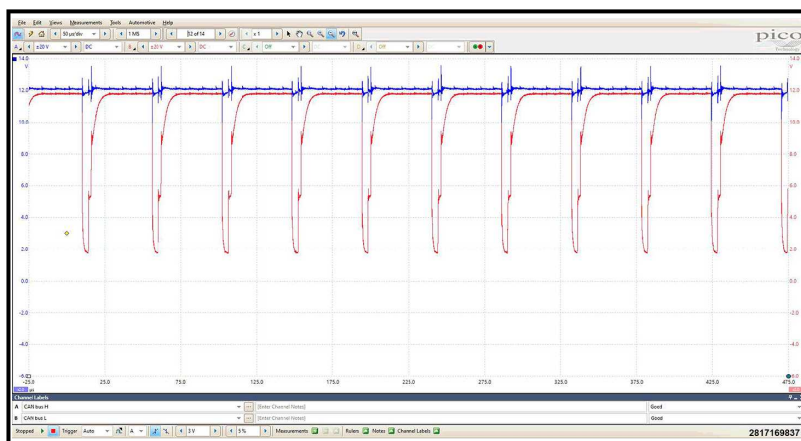


- (-) Short To Ground



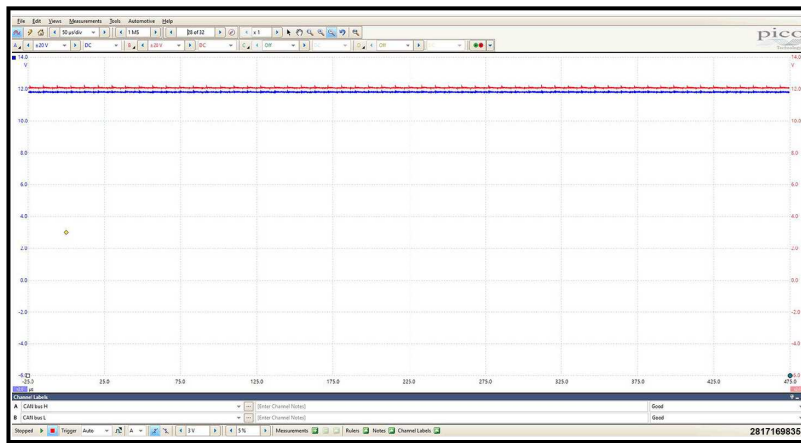
- (+) Short To Voltage

NOTE: Channel A and B voltage measurements taken at the 20 V range, measurements taken at 10 V range would display a Channel overrange message.

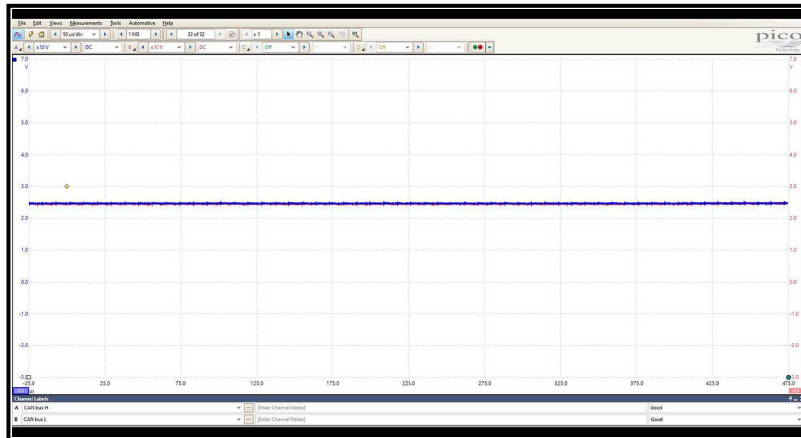


- (-) Short To Voltage

NOTE: Channel A and B voltage measurements taken at the 20 V range, measurements taken at 10 V range would display a Channel overrange message.

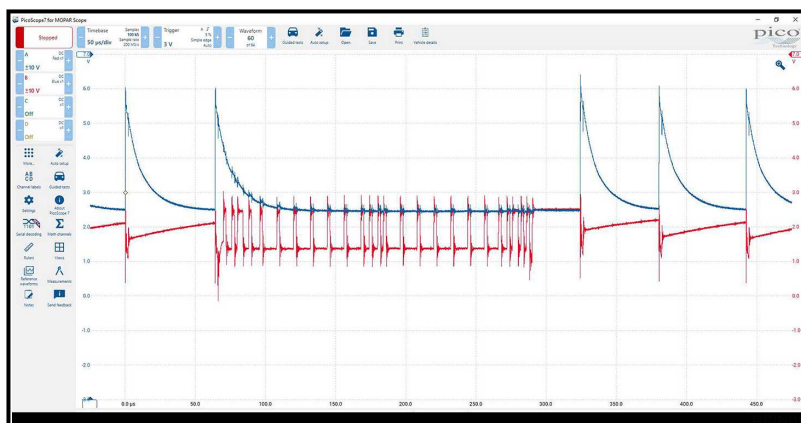


- Short Together



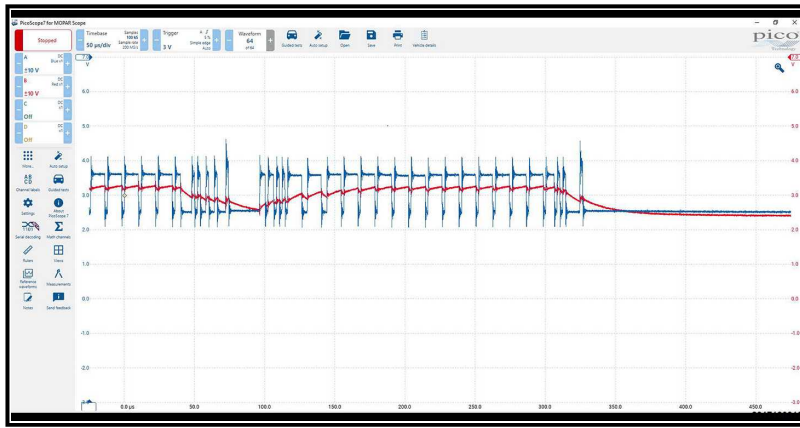
- (+) Circuit Open

NOTE: The scope pattern shown is from the ECU side missing the HIGH side connection to the CAN bus harness. When checking the CAN bus is checked from the harness side a normal CAN bus scope pattern will appear.



- (-) Circuit Open

NOTE: The scope pattern shown is from the ECU side missing the LOW side connection to the CAN bus harness. When checking the CAN bus is checked from the harness side a normal CAN bus scope pattern will appear.



Did the Mopar Scope show the CAN-C bus waveform fault?

NOTE:

The CAN communication network wires typically contain 33-50 twists per meter (one twist for every 20 to 30.3 mm, or one twist for every 0.75 to 1.2 inches). It is important to maintain the twisted pair configuration whenever servicing a dual-wire communication network.

The length of the circuit wires are also important in communication systems so both wires need to maintain their same lengths or it can result in communication fault / error.

Due to the twisted pair configuration and length of wiring, an overlay harness is NOT a recommended repair.

- Use the wiring diagrams as a guide to follow the path of the circuit(s) to isolate the fault further and then repair / replace as needed.
- The condition that originally caused the concern may not be present at this time.
- Continue to use the Mopar Scope and wiring diagrams as a guide to trace the circuits and look for any in-line connectors where the fault could occur intermittently by wiggling the wire harness and connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Look for broken, bent, pushed out or corroded terminals. Verify that there is good pin to terminal contact in the related wire harness connectors.
- Perform any Technical Service Bulletins (TSBs) that may apply.

CHECKING CAN-IHS BUS USING MOPAR SCOPE

THEORY OF OPERATION CAN-IHS

1. CHARACTERISTICS OF CAN-IHS

1. CAN-IHS is an event-driven multiplexed network that allows modules to share data. CAN-IHS is a medium-speed bus operating at 125 kbps. The voltages, termination resistance, and wiring configuration, are very similar to that of CAN-C. CAN-IHS is primarily used for interior and body systems. FCA vehicles that utilize a CAN bus architecture for module communication use either a CAN-IHS bus or another network called the CAN-B bus for interior module communication. While both CAN-IHS and CAN-B communication networks are utilized for similar purposes, modules on the CAN-IHS network are internally different from modules on the CAN-B bus. The CAN-IHS is wired using stub, or backbone, topology.

2. CAN MESSAGE CONTENT, ARBITRATION, AND TERMINATION

1. The CAN network is the most common vehicle communication network and is quickly becoming the industry standard. While other communication network protocols do exist, we will focus on the details of the CAN vehicle communication protocol. Knowledge of the CAN protocol is crucial

because every late model FCA vehicle currently uses some form of CAN-based communication network.

A characteristic with CAN communication networks is that each module can bias the network. This means each module can alter the voltage level of the network, both on CAN (+) and CAN (-). Modules transmit information by biasing the network, and receive information by measuring the changing bias.

Information is shared over a CAN network using a sequence of controlled voltage pulses sent out on the bus wires. At the proper time, a module biases the bus voltage to transmit a data signal. It does so with a sequence of voltage pulses that vary in frequency. The combination of these voltage pulses forms a data message and is called a data frame. By design, CAN modules will recognize certain frequency voltage pulses at specific times. The sequence of voltage pulses that form a data frame can be broken down into specific parts.

Start of frame (SOF) - The transmission of data begins with the sending module biasing the bus dominant from a recessive state.
Arbitration Field - The sending module identifies itself, and is prioritized; modules that require data from the sending module are alerted.
Control Field - Identifies the format and bit construction of a message.
Data Field - The actual data or information is contained within this field. The DLC (Data Length Code) in Classic CAN uses 0-8 bytes.
Cyclical redundancy check (CRC) - A redundant check that verifies the message was received correctly.
Acknowledgement (ACK) - Receiving modules verify if they successfully received the intended information.
End of frame (EOF) - The bus returns to a recessive state, signaling the end of the transfer of data. There are two frame formats used in classic CAN: • CAN base format - 11 bit identifier and fixed bit rate. • CAN extended format - 29 bit identifier and fixed bit rate.

3. ARBITRATION

1. When multiple modules are connected to a single communication network, there is a potential that two modules could attempt to transmit data on to the network at the same time. To prevent this from occurring, modules that are considered more important will have priority when attempting to transmit data. The less important modules are signaled to wait until all other data transfers are complete. This process is called arbitration. When normal operation occurs, arbitration prevents modules from disrupting the network. If a module fails and ceases to adhere to this arbitration, faults could occur on the communication network.

4. THEORY AND OPERATION OF CAN-IHS

1. Like CAN C voltages can only be seen using an oscilloscope. Each module on the CAN-IHS bus provides its own bias. This means that every module can apply power and ground on the data bus, allowing all modules to send and receive data. The active, idle, and sleep voltages are approximately the same for CAN-IHS as they are for both Diagnostic CAN-C, CAN-C and FD. The CAN (+) and CAN (-) will be biased to 2.5V. When active, or dominant, CAN (+) is pulled high to 3.5V, and CAN (-) is pulled low to 1.5V. The CAN-IHS bus is always awake when the ignition is ON. Multi Meter's will average the readings. When using a Multi Meter, in the active state, normal voltages levels on CAN (+) are approximately 2.5V to 2.7V, and on CAN (-) are approximately 2.5V to 2.3V. CAN-IHS can go into sleep mode when the ignition is in the OFF position. When in sleep mode, voltages on both CAN (+) and CAN (-) are 0V. Modules that are powered by an ignition-OFF draw (IOD) fuse can awaken the network if a switched input, such as a door ajar switch, is activated.

5. CAN-IHS SLEEP VOLTAGES

1. The CAN-IHS bus is awake whenever the ignition switch is turned to RUN. With the ignition in the OFF position, modules on the CAN-IHS network will time out and go to sleep. When the

modules are asleep, voltages on the CAN-IHS bus will read 0V. The CAN-IHS can awaken without the ignition switch turning to the RUN position due to direct inputs, such as a door ajar switch, or bus inputs from another module.

6. TERMINATION RESISTANCE

1. Just like the CAN-C and FD network, termination resistance is used in the CAN-IHS circuit to separate CAN (+) and CAN (-) voltages and to absorb any stray voltage spikes throughout the communication network, preventing network signal interference. Optimal CAN-IHS bus total circuit termination resistance is 60 ohms. In some CAN architectures (Stub, Hub, or Daisy-Chain), this is achieved using two 120-ohm resistors located inside dominant network modules or Star Connectors if equipped. Certain CAN-IHS non-dominant modules have some level of termination resistance, typically around 2.8-3.0 kilo-ohms. Remember that with the modules on the CAN-IHS network, the termination resistors are wired in parallel in the network. Because of this, the 2.8-3.0 kilo-ohms resistance in other modules will have some effect on total circuit resistance. Initially, all non-dominant CAN-IHS modules had some internal termination resistance. To permit common modules on multiple platforms, termination resistance is no longer present in many of these modules.

7. TOLERANCE

1. CAN-IHS has a limited fault tolerance. If either CAN (+) or CAN (-) are shorted to voltage or together, communication is not possible. When an open occurs on both wires in the circuit, any module downstream of the open will not communicate. CAN-IHS can withstand certain short to ground faults on the CAN (-) circuit. Communication can still occur because a voltage difference between CAN (+) and (-) is possible when the CAN (+) voltage is pulled above 0V.

8. FAULT SYMPTOMS AND DIAGNOSIS

1. When communication hard faults occur on the CAN-IHS communication network, such as a short circuit, open circuit, or an internally shorted module, the vehicle's windshield wipers typically will run continuously and the head lamps will stay on. U-codes will be found in the gateway module and possibly other modules. If a specific module is separated or drops off the network, loss of functions controlled by that module will occur, and U-codes will be set in several modules. When diagnosing a CAN-IHS fault, remember to:

Begin by measuring bus voltages and total circuit termination resistance.
Check power, ground, and voltages on both bus circuits to any suspect module before replacement of that module.
If communication on an entire network or networks is not possible, ensure the scan tool is functioning properly and operating with the latest software
Failed modules or an open circuit fault that isolates a dominant module may produce network corruption.

9. CAN BUS FAULTS

1. There are five types of CAN Bus messaging faults, they are as follows:

TYPE	DESCRIPTION
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/sending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/sending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like

TYPE	DESCRIPTION
	shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

10. CORRUPTION

1. A certain type of fault called corruption exhibits unique fault symptoms. One type of corruption occurs when an open on CAN (+), CAN (-), or both, separates a dominant module or Star Connector if equipped from the network. Removing the dominant module (or Star Connector if equipped) greatly affects the optimal termination resistance. Failed modules may produce network corruption. When a module that has termination fails, it may attempt to communicate (bias) on only CAN bus (+) or (-), causing corruption. Another type of corruption is caused by EMI due to stray, high-voltage magnetic fields or untwisted communication wires. When corruption occurs, communication may still be possible, but erratic. When viewed with a diagnostic scan tool, corruption causes the network modules to flash between yellow and red, indicating they are communicating one moment but not the next. If one particular module stays red (not communicating) and does not flash, suspect a concern with either this module, its connectors, or the bus circuits leading up to that module.

Electronic Control Units require the following four components to properly communicate on a Controller Area Network (CAN) data bus: Power (Battery/Fused B+/Ignition), Ground, CAN bus voltage and correct vehicle configuration.

If the message detected conflicts with the CRC the ECU receiving it will determine the message to be an error and consider that communication has not been possible. Diagnosis of this condition using the Mopar Scope may reveal activity that appears to be bus data messaging, even if no actual communication is possible. Communication problems that affect the whole bus, as a result of opens and terminal push outs are more likely to occur on data busses that operate at a high speed than a data bus that operates at a lower speed.

CAN Bus Voltages (Normal Operation)								
CAN-IHS Bus Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN-L Short to Ground	CAN-H Short to Ground	CAN-L Short to Battery	CAN-H Short to Battery	CAN-H Short to CAN-L
CAN-L (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V
Notes								
All measurements taken between node ground and CAN terminal with a standard DVOM. DVOM will display average network voltage.								
Total resistance of CAN-IHS network can also be measured (60 ohms).								

CAN BUS TERMINATION RESISTANCE TABLE											
NON-DOMINANT	0	1	2	3	4	5	6	7	8	9	10
ONE DOMINANT	120.00	115.38	111.11	107.14	103.44	100.00	96.77	93.75	90.90	88.23	85.71
TWO DOMINANT	60.00	58.82	57.69	57.60	55.55	54.54	53.57	52.63	51.73	50.84	50.00

CAN BUS TERMINATION RESISTANCE TABLE											
NON-DOMINANT	0	1	2	3	4	5	6	7	8	9	10
NON-DOMINANT	11	12	13	14	15	16	17	18	19	20	
ONE DOMINANT	83.33	81.08	78.94	76.87	75.00	73.17	71.42	69.76	69.18	66.66	
TWO DOMINANT	49.18	48.38	47.61	46.87	46.15	45.45	44.77	44.11	43.47	42.85	

Possible Causes

DEALER INSTALLED EQUIPMENT
 ECU POWER SUPPLY (FUSED B+/IGNITION) RELATED CIRCUIT(S) OPEN CIRCUIT, SHORTED TO GROUND OR ANOTHER CIRCUIT
 ECU GROUND CIRCUIT(S) OPEN/HIGH RESISTANCE
 ECU CAN BUS CIRCUIT(+/-) OPEN/HIGH RESISTANCE, SHORTED TO GROUND, TOGETHER, VOLTAGE, OR ANOTHER CIRCUIT
 STAR CONNECTOR (IF EQUIPPED)
 ECU

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

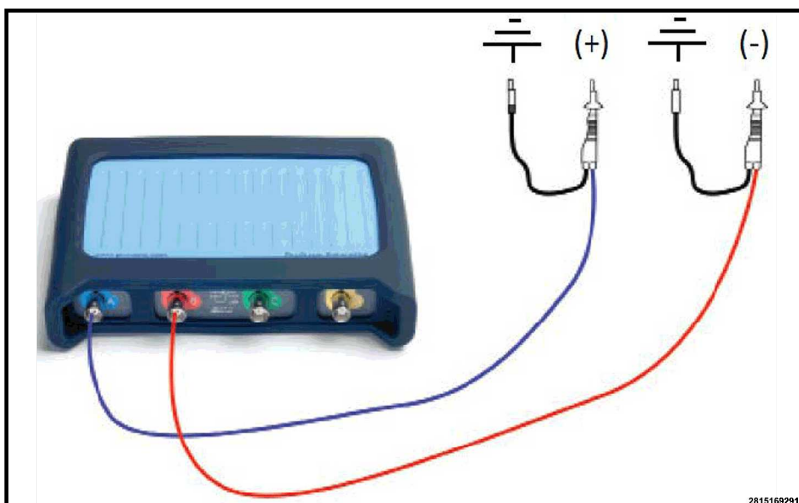
TESTING CAN BUS USING THE MOPAR SCOPE

NOTE: Some vehicles can have multiple CAN connections within a connector, make sure that you are testing the same CAN for both circuits.

For a complete CAN BH BUS SYSTEM (if equipped) wiring diagram, Refer to the appropriate wiring information .

For a complete CAN IHS BUS SYSTEM (if equipped) wiring diagram, Refer to the appropriate wiring information .

1. Connect the black pin for each test lead to Chassis ground. Connect the blue lead to CAN (+) and the red lead to CAN (-) for the circuits to be tested.



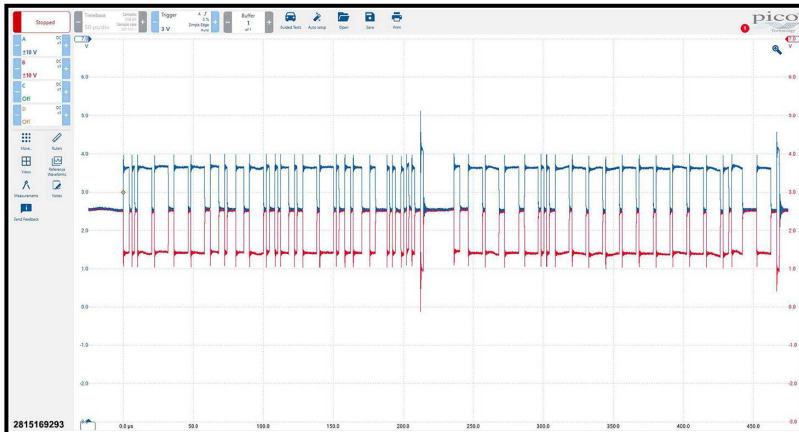
2. Start the Mopar Scope.
3. Turn the ignition on.

NOTE: When connected to the vehicle harness correctly, the LEDs on the breakout box will light up to indicate that there is activity on the bus.

4. A waveform should appear.

The image below is of a normal CAN bus waveform using the Mopar Scope.

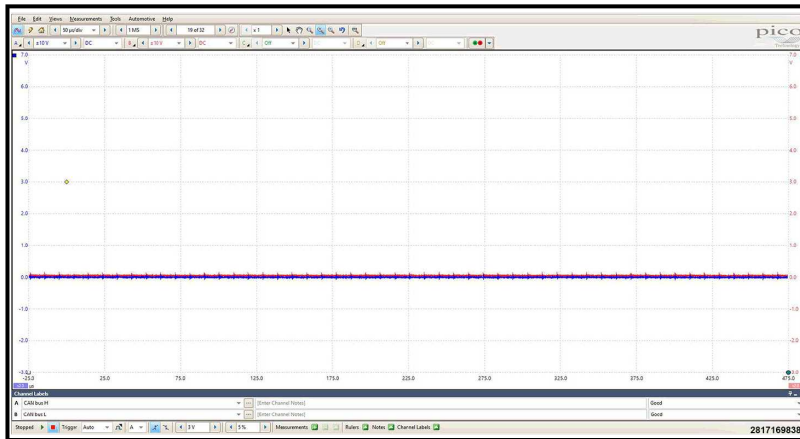
DESCRIPTION	MEASUREMENT
CHANNEL A	10 volts
CHANNEL B	10 volts
TIME BASE	50 μ s/div [microseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL



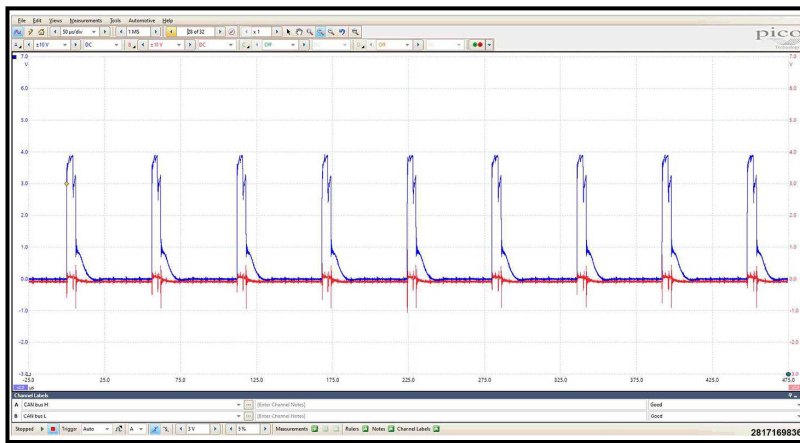
NOTE: The waveform should reveal that data is being exchanged continuously along the CAN bus and the peak voltages are correct.

5. Determine the type of CAN-IHS waveform fault the vehicle presently has from below:

- (+) Short To Ground

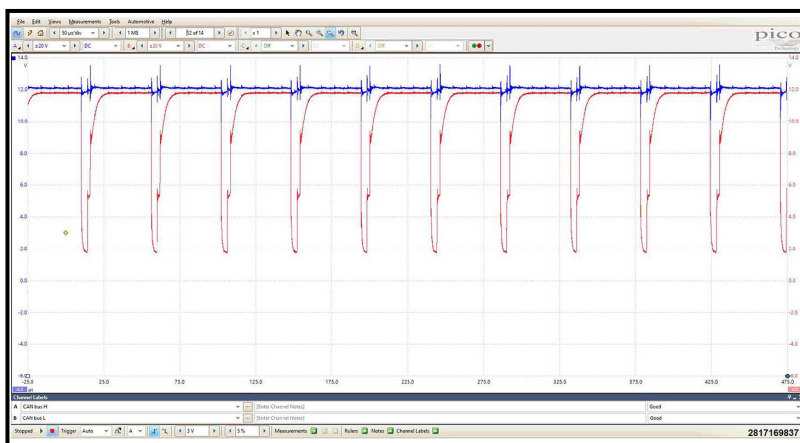


- (-) Short To Ground



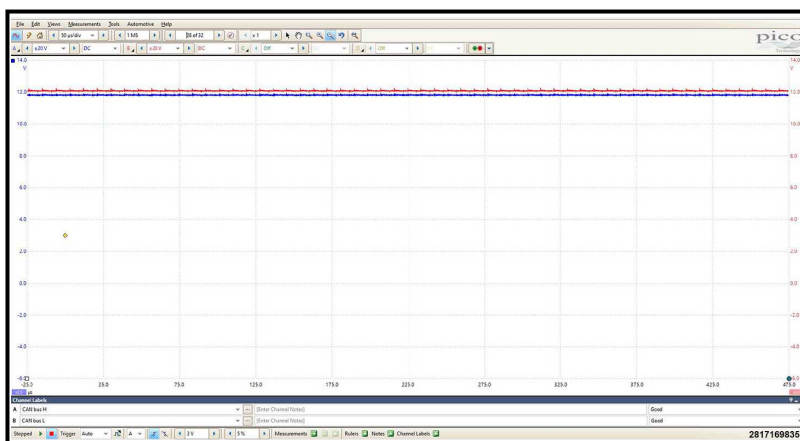
- (+) Short To Voltage

NOTE: Channel A and B voltage measurements taken at the 20 V range, measurements taken at 10 V range would display a Channel overrange message.

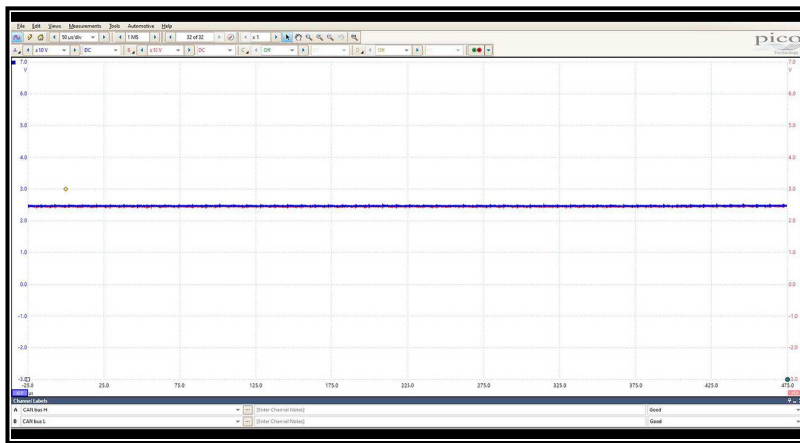


- (-) Short To Voltage

NOTE: Channel A and B voltage measurements taken at the 20 V range, measurements taken at 10 V range would display a Channel overrange message.

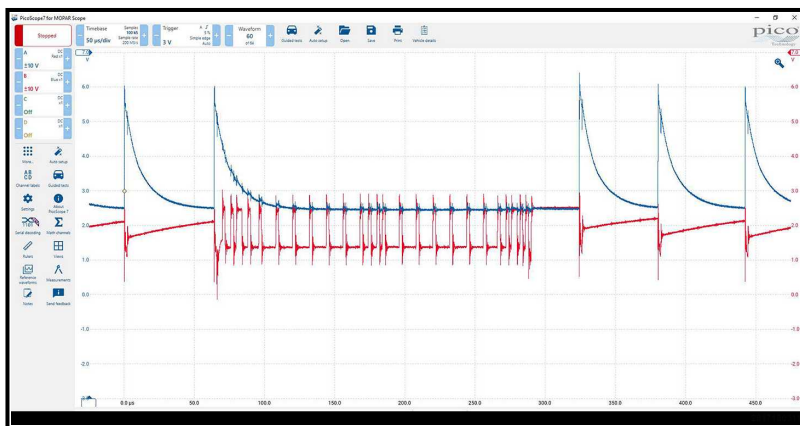


- Short Together



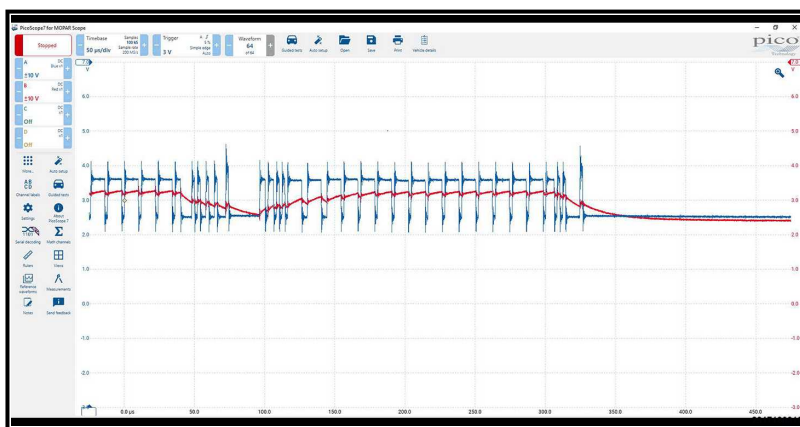
- (+) Circuit Open

NOTE: The scope pattern shown is from the ECU side missing the HIGH side connection to the CAN bus harness. When checking the CAN bus is checked from the harness side a normal CAN bus scope pattern will appear.



- (-) Circuit Open

NOTE: The scope pattern shown is from the ECU side missing the LOW side connection to the CAN bus harness. When checking the CAN bus is checked from the harness side a normal CAN bus scope pattern will appear.



Did the Mopar Scope show the CAN-IHS bus waveform fault?

NOTE: The CAN communication network wires typically contain 33-50 twists per meter (one twist for every 20 to 30.3 mm, or one twist for every 0.75 to 1.2 inches). It is important to maintain the twisted pair configuration whenever servicing a dual-wire communication network.

The length of the circuit wires are also important in communication systems so both wires need to maintain their same lengths or it can result in communication fault / error.

Due to the twisted pair configuration and length of wiring, an overlay harness is NOT a recommended repair.

- Use the wiring diagrams as a guide to follow the path of the circuit(s) to isolate the fault further and then repair / replace as needed.
- The condition that originally caused the concern may not be present at this time.
- Continue to use the Mopar Scope and wiring diagrams as a guide to trace the circuits and look for any in-line connectors where the fault could occur intermittently by wiggling the wire harness and connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Look for broken, bent, pushed out or corroded terminals. Verify that there is good pin to terminal contact in the related wire harness connectors.
- Perform any Technical Service Bulletins (TSBs) that may apply.

CHECKING LIN BUS USING MOPAR SCOPE

THEORY OF OPERATION LIN

1. CHARACTERISTICS OF LIN (Local Interface Network)

1. The LIN communication network is a single-wire, low-speed network different from the CAN networks. The LIN bus is a Class A data bus system that uses a centralized module, called a Master module, often referred to as the Master module, with a series of other modules, called Slave modules, directly wired to it on a dedicated, single-wire circuit. The communication over a LIN bus only occurs between the Master and Slave modules. Each module on the LIN bus can provide bias, but only the Master module is capable of recognizing a signal sent by a Slave module with its protected ID, only if its data has been updated. Even though it is limited, the LIN bus simplifies wiring in a vehicle by combining multiple input and output circuits on a single bus wire. The LIN bus utilizes stub (backbone) topology.

Class A	Class B	Class C	Class D
A low-speed protocol operating at speeds up to 10 kbps. It is used in older communication systems and for low priority communications (ISO-K), such as for convenience features.	A medium-speed protocol operating at speeds up to 125 kbps and is often used for body and interior systems (CAN B and CAN IHS).	A high-speed protocol, operating at speeds up to 1 mbps; because of its high speed, it is used for highly important systems that require instantaneous, real time updating of information (CAN C).	Speeds greater than 1 Mb/sec. Used in applications such as Emission diagnostics, Safety, Mobile Media and X-by Wire.

2. SPECIFIC COMPONENTS

1. The LIN bus uses a single, insulated copper wire for the data bus which connects multiple Slave modules together. Typically, Slave modules are simple inputs and outputs that may not perform self diagnostics. Controlled modules are active with the ignition in the ON position, and some may be active with the ignition in the OFF position. Components such as an instrument panel (IP) switch bank, compass module, heated seat module, and tire pressure transponders are examples of Slave modules. A LIN bus requires a Master module. The Master module accepts inputs from and sends commands to the LIN modules. A vehicle may be equipped with more than one LIN bus. For example, the tire pressure transponders may use the WIN as the Master module, and the multi-function switch may use the CCN as the Master module on a separate LIN bus.

3. MASTER MODULE

1. The Master module is central to the LIN bus system. All LIN modules connect to a Master module through the LIN bus circuit. The Master module is also wired to a CAN bus for information sharing and to allow for scan tool diagnosis. The Master module is responsible for LIN diagnostics and is capable of setting fault codes for any LIN module or circuit faults. Since a Slave module cannot communicate with any other module directly, the Master module relays LIN Slave module data over the CAN bus to the scan tool, similar to a CGW.

Controlled module inputs and commands must be given only to the Master module, which then sends the information to another Slave module or out onto the CAN bus.

4. THEORY AND OPERATION OF LIN

1. The LIN bus is biased through the Master and Slave modules. When at rest, the voltage on the LIN network is close to battery voltage. When LIN bus communication occurs, the voltage is pulled low to nearly 0V, creating a digital signal. If a Slave module is disconnected or removed from the network, that module no longer pulls voltage low on the LIN bus, and the average network voltage level will be lower. LIN voltage reads 12V when in sleep mode.

The Master module communicates with Slave modules by pulling the voltage from high to low, creating a digital signal. Controlled modules communicate with the Master by biasing the network voltage in the same manner. Even though the LIN Slave modules are wired to each other, they only recognize the voltage pulses sent by the Master module, making communication possible only between the Slave and the Master. However, LIN communication can occur between Slave modules by using the Master module to relay information.

The power feed to the LIN Slave is determined by its function. Controlled modules with a battery feed voltage supply operate and communicate even if the ignition is in the OFF position. For example, to support the hazard lamp function, the instrument panel switch bank is battery fed. If the LIN module only needs to function with the ignition ON, such as the compass module, the power feed is ignition only. The lighting and wiper multifunction switch require both feeds. This allows the lighting functions to be independent of ignition status, while the operation of the wipers requires the ignition feed.

LIN Slave modules that receive their power feed from an ignition circuit enter sleep mode when the ignition power is removed. LIN Slave modules that receive their power from a direct battery feed receive a sleep message when the vehicle data bus enters sleep mode. For circuits where the LIN modules are battery fed, either the Master or the Slave module can wake the other. If the Slave module wakes up the Master, the vehicle bus also wakes.

5. TOLERANCE

1. As with any single-wire communication bus, a LIN bus has low fault tolerance. If a short to ground or power occurs on the LIN bus, the entire LIN bus loses the ability to communicate with the Master module. If an open occurs within the network, modules on the other side of the break (that are no longer connected to the Master module) lose communication. If an open occurs within the network, modules still connected to the Master module continue to communicate. Loss of power or ground to a Slave module results in that particular Slave module losing communication as well, whereas loss of power or ground to a Master module results in no LIN bus communication. Generally, one Slave module is triggered for information at a time - meaning zero collision risk and no need for arbitration as is used in CAN (Controller Area Network). If multiple Slave modules respond, a collision occurs and the Master ECU defaults to unconditional frames.

6. FAULT SYMPTOMS AND DIAGNOSIS

1. When the LIN bus is shorted, no modules can communicate on the network and a loss of all LIN module functionality occurs. Loss of communication codes (U-codes) will set in the Master module. A short to ground or to power on the LIN bus does not affect Master module communication over the CAN bus.

Combine the LIN bus data with CAN bus data to get a complete detailed perspective of the vehicle, while in use with the Mopar Scope. Consider the following type of questions when diagnosing:

- How is driving behavior correlated with use of various LIN bus features?
- Do issues arise in the interaction between LIN Master ECUs and the CAN bus?
- Are LIN related issues correlated with certain CAN based events?

Begin diagnosis by checking the voltage on the LIN bus to see if voltage is present. Modules may be isolated by disconnecting Slave modules one at a time and then checking for LIN communication to return when a particular Slave is disconnected. When all Slave and Master modules are disconnected, test the LIN circuit for a short to ground or to power. If an open occurs, modules downstream of the open lose functionality and communication codes will set. If a single LIN Slave module is not communicating but all other LIN modules are functioning normally, always verify power, ground, and LIN voltage at the suspect module before replacing any parts. As long as at least one module on the LIN network is connected, then the circuit is able to be biased.

Possible Causes
DEALER INSTALLED EQUIPMENT
ECU POWER SUPPLY (FUSED B+/IGNITION) RELATED CIRCUIT(S) OPEN CIRCUIT, SHORTED TO GROUND OR ANOTHER CIRCUIT
ECU GROUND CIRCUIT(S) OPEN/HIGH RESISTANCE
ECU LIN BUS CIRCUIT(+/-) OPEN/HIGH RESISTANCE, SHORTED TO GROUND, VOLTAGE, OR ANOTHER CIRCUIT
SLAVE MODULE
MASTER MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

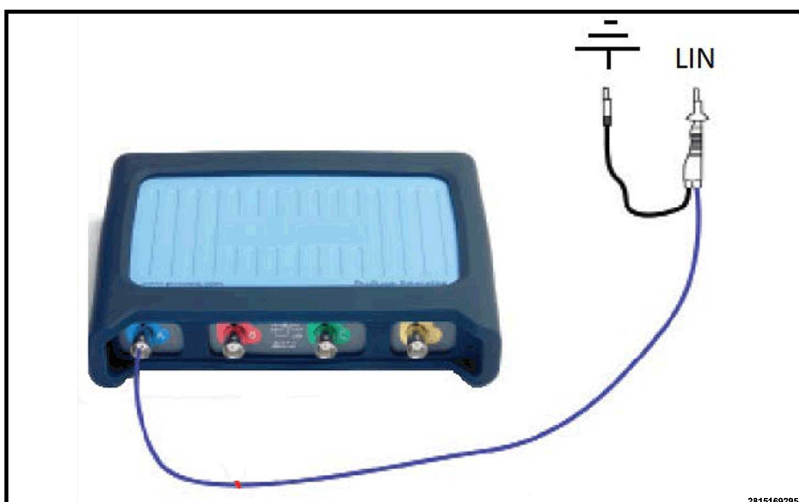
DIAGNOSTIC TEST

TESTING LIN BUS USING THE MOPAR SCOPE

NOTE: Some vehicles can have multiple LIN connections within a connector, make sure that you are testing the correct LIN circuit.

For a complete LIN BUS SYSTEM wiring diagram, Refer to the appropriate wiring information .

1. Connect the black pin for each test lead to Chassis ground. Connect the blue lead to the LIN circuit to be tested.

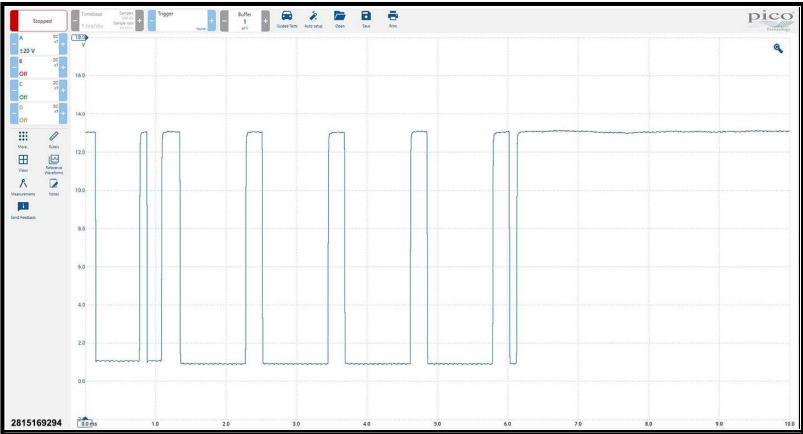


2. Start the Mopar Scope.
3. Turn the ignition on.
4. Operate the systems connected to the LIN bus being tested to observe signal changes. Move connectors and wiring to look for any signal drop-out.
5. When connected to the vehicle harness correctly, the LED on the breakout box will light up to indicate that there is activity on the bus.
6. A waveform should appear.

The image below is of a normal LIN bus waveform using the Mopar Scope.

DESCRIPTION	MEASUREMENT
CHANNEL A	20 volts
TIME BASE	1 ms/div [milliseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL

NOTE: The Mopar Scope has preset **Guided Tests for Communications** testing of the LIN bus.



7. The waveform should reveal that data is being exchanged continuously along the LIN bus and the peak voltages are correct.
8. Determine the type of LIN waveform fault (short, open, etc.) the vehicle presently has.

Did the Mopar Scope show the LIN bus waveform fault?

- Use the wiring diagrams as a guide to follow the path of the circuit(s) to isolate the fault further and then repair / replace as needed.
- The condition that originally caused the concern may not be present at this time.
- Continue to use the Mopar Scope and wiring diagrams as a guide to trace the circuits and look for any in-line connectors where the fault could occur intermittently by wiggling the wire harness and connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Look for broken, bent, pushed out or corroded terminals. Verify that there is good pin to terminal contact in the related wire harness connectors.
- Perform any Technical Service Bulletins (TSBs) that may apply.

NO RESPONSE FROM ECU

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

THEORY OF OPERATION

Electronic Control Units (ECUs) require the following four components to properly communicate on a Controller Area Network (CAN) data bus:

- Power (Battery/Fused B+/Ignition)
- Ground
- Correct CAN bus voltage
- Correct vehicle configuration

CAN BUS FAULTS

TYPES OF CAN BUS FAULTS	
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/offending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/offending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

Several ECUs on this vehicle are connected to and communicate on multiple CANs. For additional information on the communication network(s), Refer to the appropriate service information.

WHEN MONITORED AND SET CONDITIONS

Possible Causes
DEALER INSTALLED EQUIPMENT POWER SUPPLY (FUSED B+/IGNITION) RELATED CIRCUIT(S) SHORTED TO GROUND, OPEN, OR SHORTED GROUND CIRCUIT(S) OPEN/HIGH RESISTANCE CAN BUS CIRCUIT(+/-) OPEN/HIGH RESISTANCE ELECTRONIC CONTROL UNIT (ECU)

If the **COMMUNICATION DIAGNOSTIC PROCEDURE** has not been performed. Refer to **STANDARD PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK THE ECU STATUS ON THE CAN BUS

1. Turn the ignition on.
2. With the scan tool, read the Controller Area Network (CAN) topology on the Vehicle View screen.

NOTE: This vehicle may be equipped with a CAN architecture using multiple CAN buses (i.e. CAN-BH, CAN-C1, CAN-C2, CAN-FD, CAN-IHS etc.) for communication with an ECU.

Is the ECU active on all of the CAN buses connected to the ECU?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

No

- Go To [2](#)

2. CHECK THE VEHICLE CONFIGURATION

1. Turn the ignition off.
2. Connect a battery charger to the vehicle battery to maintain proper system voltage during this diagnostic procedure.
3. Leave the scan tool connected and on the Vehicle View screen. The CAN bus will remain active with the scan tool connected and the ignition off.
4. Using Dealer Connect, perform a Single VIN Inquiry.
5. Select the OPTIONS tab.
6. Review the information found under the Dealer Installed Equipment section.

NOTE: This is to review the possibility of an Electronic Control Unit upgrade/addition (i.e. upgrading a Radio from a base to a Premium or the addition of a Rear Seat Video System).

Does this vehicle have any Dealer Installed Equipment?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE DEALER INSTALLED EQUIPMENT

Is the Dealer Installed Equipment related to the ECU that is not active on the bus?

Yes

- Contact Mopar Accessories for further technical and diagnostic support.

No

- Go To [4](#)

4. ISOLATE AND LOAD TEST ALL POWER SUPPLY (FUSED B+/IGNITION) RELATED CIRCUITS TO THE ECU FOR A SHORT TO GROUND, OPEN, OR HIGH RESISTANCE

1. Check the fuse for an open. If the fuse is open, make sure to check for a short to ground prior to replacing the fuse.
2. The ignition must be off when performing a load test on a circuit.
3. Isolate the circuit(s) by disconnecting the Electronic Control Unit (ECU) and all other harness connectors containing the circuit(s) being tested.
4. Connect the positive lead of the load test tool to the positive side of the Battery (A). Refer to the diagram below.
5. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the ECU harness connectors (B).
6. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other ECU/Power Distribution Center

(PDC) harness connector (C and D).

7. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

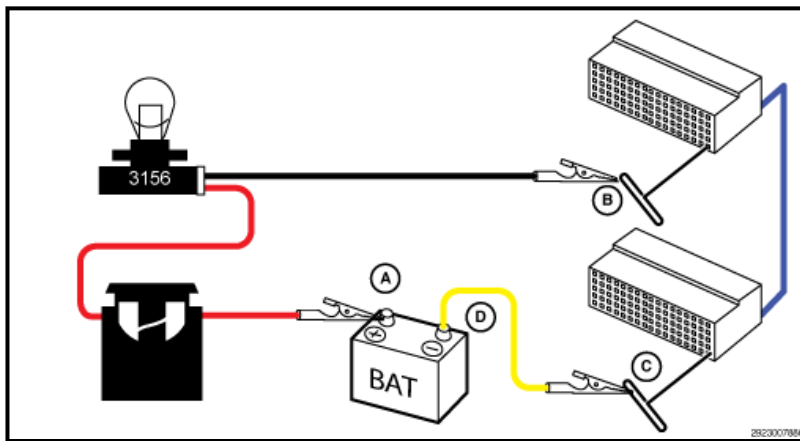
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the circuit(s) for an open or high resistance.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. CHECK THE GROUND CIRCUIT(S) TO THE ECU BY LOAD TESTING THE CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Disconnect the ECU harness connector to isolate the ground circuit(s).
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the ECU harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test

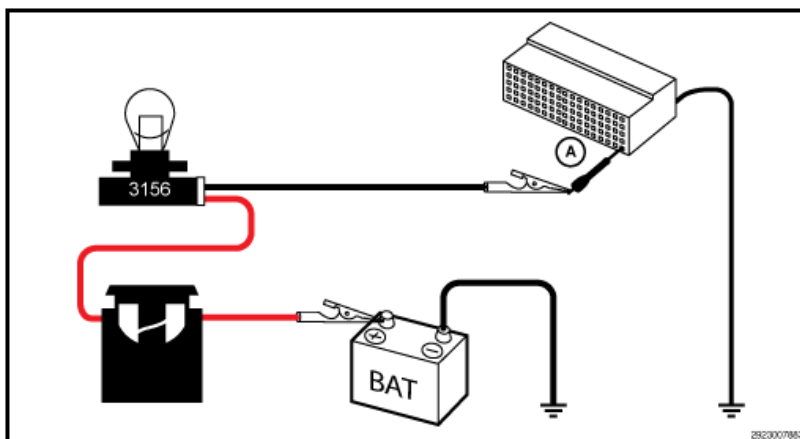
tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the ground circuit(s) for an open or high resistance.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

6. CHECK THE CAN BUS (+) CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE

1. Measure the voltage on the CAN Bus (+) circuit(s) at the harness connector(s) of the ECU.

Is the voltage below 2.6 volts?

NOTE:

The CAN communication network wires typically contain 33-50 twists per meter (one twist for every 20 to 30.3 mm, or one twist for every 0.75 to 1.2 inches). It is important to maintain the twisted pair configuration whenever servicing a dual-wire communication network.

The length of the circuit wires are also important in communication systems so both wires need to maintain their same lengths or it can result in communication fault / error.

Due to the twisted pair configuration and length of wiring, an overlay harness is NOT a recommended repair.

Yes

- Repair the CAN Bus (+) circuit(s) for an open or high resistance.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [7](#)

7. CHECK THE CAN BUS (-) CIRCUIT(S) FOR AN OPEN OR HIGH RESISTANCE

1. Measure the voltage on the CAN Bus (-) circuit(s) at the harness connector(s) of the ECU.

Is the voltage below 1.3 volts?

NOTE:

The CAN communication network wires typically contain 33-50 twists per meter (one twist for every 20 to 30.3 mm, or one twist for every 0.75 to 1.2 inches). It is important to maintain the twisted pair configuration whenever servicing a dual-wire communication network.

The length of the circuit wires are also important in communication systems so both wires need to maintain their same lengths or it can result in communication fault / error.

Due to the twisted pair configuration and length of wiring, an overlay harness is NOT a recommended repair.

Yes

- Repair the CAN Bus (-) circuit(s) for an open or high resistance.

- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect the scan tool at this time.
2. Disconnect all related harness connectors to the ECU.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related ECU harness connectors.
5. Inspect harness connectors, ECU connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all related harness connectors to the ECU. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related ECU harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. Turn the ignition on.
10. With the scan tool, read the Controller Area Network (CAN) topology on the Vehicle View screen.

Is the ECU active on all of the CAN buses connected to the ECU?

NOTE: Choose the one answer that best describes the vehicle condition that exists.

WITHOUT previous history of a related concern.

- The ECU is active on all of the CAN buses connected to the ECU.
- The wiring or poor connection problem has been repaired.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

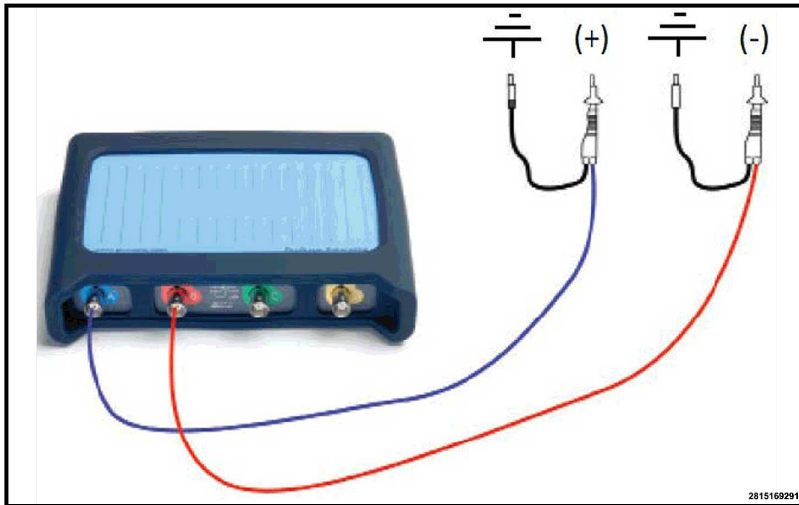
WITH previous history of a related concern.

- The ECU is active on all of the CAN buses connected to the ECU.. OR.. The ECU is not active on all of the CAN buses connected to the ECU.
- Go To [9](#)

9. CHECK THE CAN BUS COMMUNICATION WITH THE MOPAR SCOPE

NOTE: Some vehicles can have multiple CAN connections within a connector, make sure that you are testing the same CAN for both circuits.

Connect the black pin for each test lead to Chassis ground. Connect the blue lead to CAN (+) and the red lead to CAN (-) for the circuits to be tested.



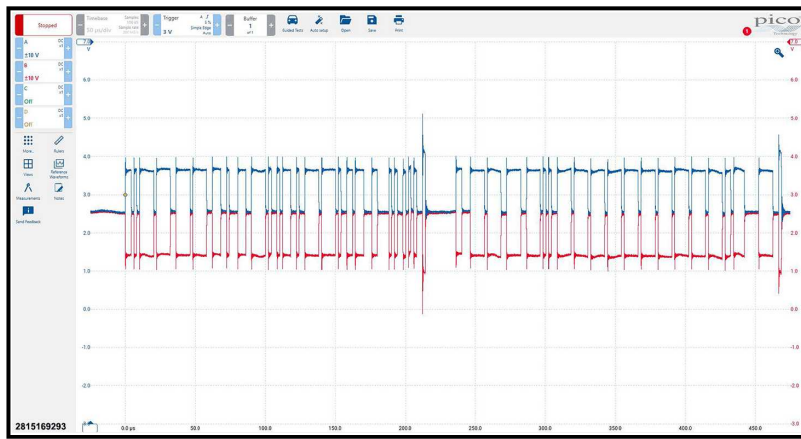
1. Start the Mopar Scope.
2. Once the Mopar Scope is running, select **Guided Tests** .
3. Select **Communications** .
4. Select **CAN L&H** .
5. Select **CAN bus testing / diagnostics** .
6. Select **Load settings file** .
7. Turn the ignition on.

NOTE: When connected to the vehicle harness correctly, the LEDs on the breakout box will light up to indicate that there is activity on the bus.

8. A waveform should appear.

The image below is of a normal CAN bus waveform using the Mopar Scope. The waveform should reveal that data is being exchanged continuously along the CAN bus and the peak voltages are correct.

DESCRIPTION	MEASUREMENT
CHANNEL A	10 volts
CHANNEL B	10 volts
TIME BASE	50 μ s/div [microseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL



9. With the Mopar Scope running, use the wiring diagrams as a guide to trace the circuits and look for any in-line connectors where the fault could occur intermittently by wiggling **ALL related** wire harness and connectors.

Did the Mopar Scope show the CAN bus waveform fault?

NOTE:

The CAN communication network wires typically contain 33-50 twists per meter (one twist for every 20 to 30.3 mm, or one twist for every 0.75 to 1.2 inches). It is important to maintain the twisted pair configuration whenever servicing a dual-wire communication network.

The length of the circuit wires are also important in communication systems so both wires need to maintain their same lengths or it can result in communication fault / error.

Due to the twisted pair configuration and length of wiring, an overlay harness is **NOT** a recommended repair.

Yes

- Repair any conditions that are found.
- Replace the ECU in accordance with the Service information.
- Perform the appropriate ECU verification test. If a verification test is not available, perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

STORED LOST COMMUNICATION DTCS

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.
- The Body Control Module (BCM) is configured correctly.

SET CONDITION

- CAN Bus messages are not received for greater than two seconds.

POSSIBLE CAUSES

Possible Causes
CAN C BUS CIRCUITS OPEN OR SHORT
CAN IHS BUS CIRCUITS OPEN OR SHORT
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
BCM NOT CONFIGURED CORRECTLY
POWER OR GROUND FROM THE REPORTING MODULE
MODULE THAT SET THIS DTC
PREVIOUS SERVICE PERFORMED WITHIN THE LAST 100 KEY CYCLES (FUSE/RELAYS REMOVED, WIRING SERVICE, BATTERY DISCONNECT)
LOW BATTERY/JUMP START CONDITION
CHECK FOR RELATED SERVICE BULLETINS

DIAGNOSTIC TEST

1. VERIFY DIAGNOSTIC TROUBLE CODE (DTC) IS STORED

NOTE: Stored faults may indicate a customer perceived intermittent condition.

NOTE: Make sure the battery voltage is between 10 and 16 volts before proceeding.

1. Turn the ignition on.
2. With the scan tool, read stored DTCs and record on the repair order.

Is this DTC stored?

Yes

- Go To [2](#)

No

- Go to and perform the appropriate diagnostic procedure.

2. CHECK THE ENVIRONMENTAL DATA

1. With the scan tool, read the loss of communication environmental data.

Does the loss of communication environmental odometer data match up to any of the previous service procedures listed in the possible causes or are there any stored CAN C hardware electrical, battery, ignition voltage, VIN missing/mismatch, or BCM configuration DTCs present with matching environmental data?

Yes

- These DTCs may have been the result of other service procedures performed. Clear the DTCs.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. VERIFY INTERMITTENT LOST COMMUNICATION DTC - WIRING CONCERNS

1. With the scan tool, read all DTCs.

Is there more than one ECU with stored DTCs "Logged Against" the module and one or more lost communication DTCs stored in the sending module?

Yes

- Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

No

- Go To [4](#)

4. VERIFY INTERMITTENT LOST COMMUNICATION DTC - SENDING MODULE

1. With the scan tool, read all DTCs.

Is there more than one ECU with stored DTCs "Logged Against" the module and NO lost communication DTCs stored in the sending module?

Yes

- Check for a Service Bulletin related to this sending module.

No

- Go To [5](#)

5. VERIFY INTERMITTENT LOST COMMUNICATION DTC - REPORTING MODULE

1. With the scan tool, read all DTCs.

Is there ONLY ONE ECU with stored DTCs "Logged Against" the module?

Yes

- Check for a Service Bulletin related to the module that set this DTC.

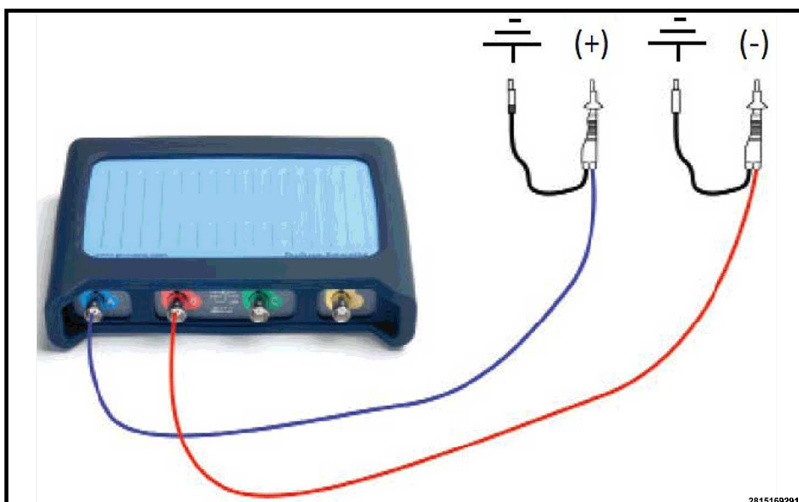
No

- Go To [6](#)

6. CHECK THE CAN BUS COMMUNICATION WITH THE MOPAR SCOPE

NOTE: Some vehicles can have multiple CAN connections within a connector, make sure that you are testing the same CAN for both circuits.

Connect the black pin for each test lead to Chassis ground. Connect the blue lead to CAN (+) and the red lead to CAN (-) for the circuits to be tested.



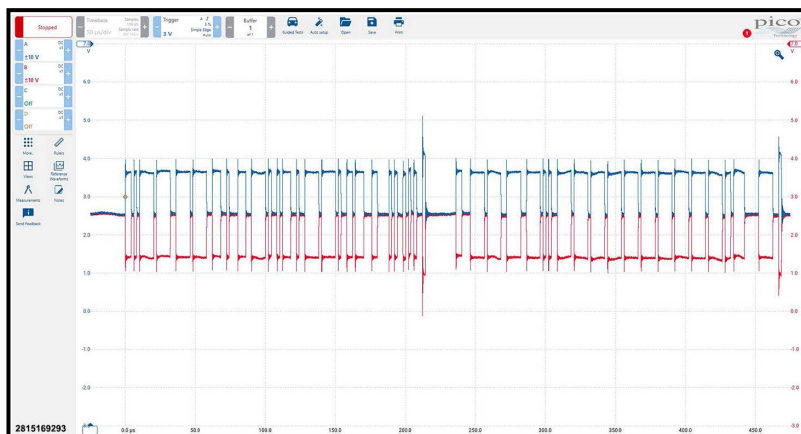
1. Start the Mopar Scope.
2. Once the Mopar Scope is running, select **Guided Tests** .
3. Select **Communications** .
4. Select **CAN L&H** .
5. Select **CAN bus testing / diagnostics** .
6. Select **Load settings file** .
7. Turn the ignition on.

NOTE: When connected to the vehicle harness correctly, the LEDs on the breakout box will light up to indicate that there is activity on the bus.

8. A waveform should appear.

The image below is of a normal CAN bus waveform using the Mopar Scope. The waveform should reveal that data is being exchanged continuously along the CAN bus and the peak voltages are correct.

DESCRIPTION	MEASUREMENT
CHANNEL A	10 volts
CHANNEL B	10 volts
TIME BASE	50 μ s/div [microseconds / division control]
ZOOM / VIEW	X1 - HORIZONTAL & VERTICAL



With the Mopar Scope running, use the wiring diagrams as a guide to trace the circuits and look for any in-line connectors where the fault could occur intermittently by wiggling **ALL related** wire harness and connectors.

NOTE: A reporting ECU sets DTCs against a Sending ECU.

Did the Mopar Scope show the CAN bus waveform fault?

NOTE: The CAN communication network wires typically contain 33-50 twists per meter (one twist for every 20 to 30.3 mm, or one twist for every 0.75 to 1.2 inches). It is important to maintain the twisted pair configuration whenever servicing a dual-wire communication network.

The length of the circuit wires are also important in communication systems so both wires need to maintain their same lengths or it can result in communication fault / error.

Due to the twisted pair configuration and length of wiring, an overlay harness is NOT a recommended repair.

Yes

- Check for related Technical Service Bulletins (TSB's).
 - Repair any conditions that are found.
 - For intermittent communication issues, or if multiple communication related DTCs are set in other Electronic Control Modules (ECUs), check the suspected ECU power and ground circuits, including at the body sheet-metal, for loose or poor connections. Performing a load test on these circuits will verify the circuit is capable of carrying the amperage needed to perform properly, along with confirming that excessive resistance does not exist in the circuit(s) being tested. For additional information on CIRCUIT LOAD TESTING PROCEDURES. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .
 - If there is a history of this DTC setting multiple times, replace the reporting ECU in accordance with the Service Information.
 - Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to [**STANDARD PROCEDURE**](#) .
 - If there is a history of this DTC setting multiple times, replace the sending ECU in accordance with the Service Information.
 - Perform the appropriate VERIFICATION TEST. If a VERIFICATION TEST is not available for an ECU, perform the BCM VERIFICATION TEST. Refer to [**STANDARD PROCEDURE**](#) .
-

2021 GENERAL INFORMATION

(Digital TV Module - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B1499-11	B1499-11 - TV ANTENNA 1-CIRCUIT SHORT TO GROUND
B1499-12	B1499-12 - TV ANTENNA 1-CIRCUIT SHORT TO BATTERY
B1499-13	B1499-13 - TV ANTENNA 1-CIRCUIT OPEN
B149B-11	B149B-11 - TV ANTENNA 2-CIRCUIT SHORT TO GROUND
B149B-12	B149B-12 - TV ANTENNA 2-CIRCUIT SHORT TO BATTERY
B149B-13	B149B-13 - TV ANTENNA 2-CIRCUIT OPEN
B1550-4B	B1550-4B - DIGITAL TELEVISION MODULE-OVER TEMPERATURE
B2199-16	B2199-16 - BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
B2199-17	B2199-17 - BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
B21DD-84	B21DD-84 - SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
B21DD-85	B21DD-85 - SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
B2206-00	CURRENT VIN MISSING / MISMATCH
B222C-00	VEHICLE CONFIGURATION NOT PROGRAMMED
B22A9-00	B22A9-00 - ECU INTERNAL PERFORMANCE
B23C4-12	B23C4-12 - SIDE CAMERA-CIRCUIT SHORT TO BATTERY
B23C4-14	B23C4-14 - SIDE CAMERA-CIRCUIT SHORT TO GROUND OR OPEN
B23C5-12	B23C5-12 - FRONT CAMERA-CIRCUIT SHORT TO BATTERY
B23C5-14	B23C5-14 - FRONT CAMERA-CIRCUIT SHORT TO GROUND OR OPEN
U0010-00	CAN INTERIOR BUS
U0011-00	CAN INTERIOR BUS OFF PERFORMANCE
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0184-00	LOST COMMUNICATION WITH RADIO

DIAGNOSIS AND TESTING

B1499-11 - TV ANTENNA 1-CIRCUIT SHORT TO GROUND

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The TV Antenna circuit is shorted to ground.

DEFAULT ACTION

- Degradation of TV signal quality

POSSIBLE CAUSES

Possible Causes
TV ANTENNA CIRCUIT SHORTED TO GROUND
TV ANTENNA SHORTED TO GROUND
DIGITAL TV (DTV) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE RELATED TV ANTENNA CONNECTION AT THE DTV MODULE

1. Turn the ignition off.
2. Verify that the related TV Antenna cable and connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE TV ANTENNA CONNECTOR AT THE DTV MODULE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the related TV Antenna connector at the DTV Module.

NOTE: The short to ground DTC should not set. An open circuit DTC should set in the DTV with the antenna disconnected.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the short to ground DTC return?

Yes

- Replace the DTV module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the related TV Antenna and the coax cable.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1499-12 - TV ANTENNA 1-CIRCUIT SHORT TO BATTERY

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The TV Antenna circuit is shorted to voltage.

DEFAULT ACTION

- Degradation of TV signal quality

POSSIBLE CAUSES

Possible Causes
TV ANTENNA CIRCUIT SHORTED TO VOLTAGE
TV ANTENNA SHORTED TO VOLTAGE
DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE RELATED TV ANTENNA CONNECTION AT THE DTV MODULE

1. Turn the ignition off.
2. Verify that the related TV Antenna cable and connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE RELATED TV ANTENNA CABLE FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the related TV Antenna connector at the DTV Module.
3. Turn the ignition on.
4. Measure the voltage of the related TV Antenna circuits at the DTV connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate tool to prevent any possible damage to the ECU terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Replace related TV Antenna and the coax cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the DTV module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1499-13 - TV ANTENNA 1-CIRCUIT OPEN

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The TV Antenna circuit is open.

DEFAULT ACTION

- Degradation of TV signal quality

POSSIBLE CAUSES

Possible Causes
BAD TV ANTENNA CONNECTION TV ANTENNA CIRCUIT OPEN TV ANTENNA OPEN DIGITAL TV (DTV) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE RELATED TV ANTENNA CONNECTION AT THE DTV MODULE

1. Turn the ignition off.
2. Verify that the related TV Antenna cable and connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT AND RECONNECT RELATED TV ANTENNA AT THE DTV MODULE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect and reconnect related TV Antenna connection at the DTV Module.
3. Start the engine and allow it to run for 30 seconds.
4. With the scan tool, read DTV DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

4. REPLACE RELATED TV ANTENNA AND THE COAX CABLE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace related TV Antenna and the coax cable.
3. Start the engine and allow to run for 30 seconds.
4. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replacing the related TV Antenna and the coax cable corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B149B-11 - TV ANTENNA 2-CIRCUIT SHORT TO GROUND

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The TV Antenna circuit is shorted to ground.

DEFAULT ACTION

- Degradation of TV signal quality

POSSIBLE CAUSES

Possible Causes
TV ANTENNA CIRCUIT SHORTED TO GROUND
TV ANTENNA SHORTED TO GROUND
DIGITAL TV (DTV) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE RELATED TV ANTENNA CONNECTION AT THE DTV MODULE

1. Turn the ignition off.
2. Verify that the related TV Antenna cable and connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE TV ANTENNA CONNECTOR AT THE DTV MODULE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the related TV Antenna connector at the DTV Module.

NOTE: **The short to ground DTC should not set. An open circuit DTC should set in the DTV with the antenna disconnected.**

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the short to ground DTC return?

Yes

- Replace the DTV module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the related TV Antenna and the coax cable.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B149B-12 - TV ANTENNA 2-CIRCUIT SHORT TO BATTERY

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The TV Antenna circuit is shorted to voltage.

DEFAULT ACTION

- Degradation of TV signal quality

POSSIBLE CAUSES

Possible Causes
TV ANTENNA CIRCUIT SHORTED TO VOLTAGE
TV ANTENNA SHORTED TO VOLTAGE
DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE RELATED TV ANTENNA CONNECTION AT THE DTV MODULE

1. Turn the ignition off.
2. Verify that the related TV Antenna cable and connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

3. CHECK THE RELATED TV ANTENNA CABLE FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the related TV Antenna connector at the DTV Module.
3. Turn the ignition on.
4. Measure the voltage of the related TV Antenna circuits at the DTV connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate tool to prevent any possible damage to the ECU terminals.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Replace related TV Antenna and the coax cable as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Replace the DTV module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B149B-13 - TV ANTENNA 2-CIRCUIT OPEN

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The TV Antenna circuit is open.

DEFAULT ACTION

- Degradation of TV signal quality

POSSIBLE CAUSES

Possible Causes
BAD TV ANTENNA CONNECTION TV ANTENNA CIRCUIT OPEN TV ANTENNA OPEN DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE RELATED TV ANTENNA CONNECTION AT THE DTV MODULE

1. Turn the ignition off.
2. Verify that the related TV Antenna cable and connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT AND RECONNECT RELATED TV ANTENNA AT THE DTV MODULE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect and reconnect related TV Antenna connection at the DTV Module.
3. Start the engine and allow it to run for 30 seconds.
4. With the scan tool, read DTV DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

4. REPLACE RELATED TV ANTENNA AND THE COAX CABLE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace related TV Antenna and the coax cable.
3. Start the engine and allow to run for 30 seconds.
4. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replacing the related TV Antenna and the coax cable corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1550-4B - DIGITAL TELEVISION MODULE-OVER TEMPERATURE

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Digital TV (DTV) Module exceeds its operating temperature.

DEFAULT ACTION

- TV and cameras unavailable, DTV HMI unavailable.

POSSIBLE CAUSES

Possible Causes
DTV TEMPERATURE OVER LIMIT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ALLOW THE AMBIENT TEMPERATURE TO STABILIZE - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. If the vehicle has been in the hot sunlight or extreme temperatures, move the vehicle indoors and open the doors to allow the inside temperature to stabilize.
2. With the scan tool, erase DTCs.
3. Start the engine and allow the engine to reach normal operating temperature.
4. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Moving the vehicle indoors and allowing the inside temperature to stabilize corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B2199-16 - BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Digital TV (DTV) Module supply voltage less than 6.5 volts.

DEFAULT ACTION

- TV and cameras unavailable, DTV HMI unavailable

POSSIBLE CAUSES

Possible Causes
BATTERY OR CHARGING SYSTEM VOLTAGE LOW
FUSED B+ CIRCUIT EXCESSIVE RESISTANCE
GROUND CIRCUIT EXCESSIVE RESISTANCE
DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCS present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#), or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. ISOLATE AND LOAD TEST THE (A238) AND (F982) FUSED (B+) CIRCUITS TO CHECK FOR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

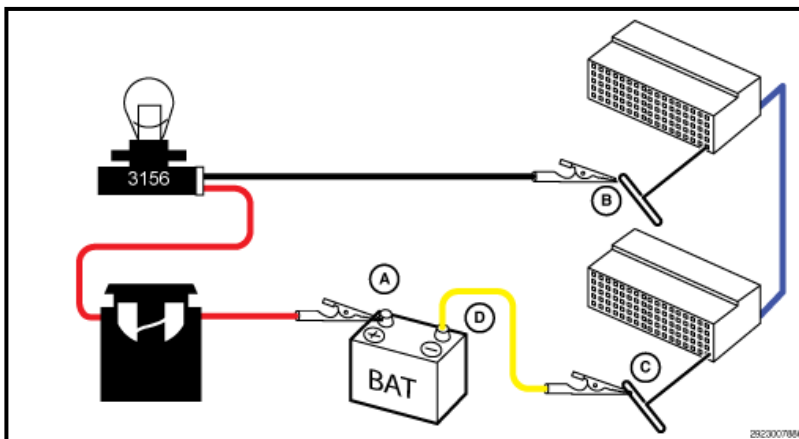
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



WARNING: To avoid possible serious or fatal injury, **DO NOT** load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright for each circuit tested?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK THE (Z912) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

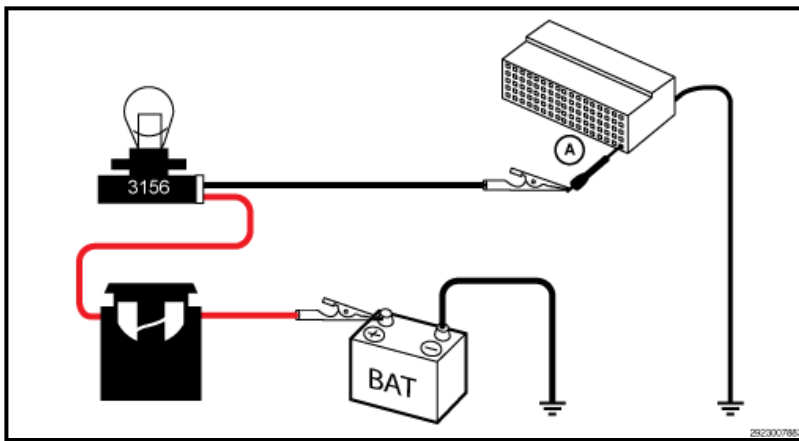
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV in accordance with the Service information.
- Perform the BCM VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BCM VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2199-17 - BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Digital TV (DTV) Module supply voltage greater than 16.0 volts.

DEFAULT ACTION

- TV and cameras unavailable, DTV HMI unavailable

POSSIBLE CAUSES

Possible Causes
BATTERY OR CHARGING SYSTEM VOLTAGE HIGH DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCs present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B21DD-84 - SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The voltage value that the Digital TV (DTV) Module received over the CAN bus is less than 6.5 volts.

DEFAULT ACTION

- Audio system not functional

POSSIBLE CAUSES

Possible Causes
BATTERY OR CHARGING SYSTEM VOLTAGE LOW
DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCs present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B21DD-85 - SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The voltage value that the Digital TV (DTV) Module received over the CAN bus is greater than 16.0 volts.

DEFAULT ACTION

- Audio system not functional

POSSIBLE CAUSES

Possible Causes
BATTERY OR CHARGING SYSTEM VOLTAGE HIGH
DIGITAL TV (DTV) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR CHARGING SYSTEM DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any battery or charging system DTCs present in the PCM?

Yes

- Perform the appropriate diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B2206-00-CURRENT VIN MISSING / MISMATCH

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Vehicle Identification Number (VIN) stored in the Digital TV (DTV) Module does not match the VIN stored in the BCM/ PCM.

DEFAULT ACTION

- None

POSSIBLE CAUSES

Possible Causes
VIN IN DIGITAL TV (DTV) MODULE DOES NOT MATCH VEHICLE VIN

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

For a complete DIGITAL TV SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Body Control Module (BCM) is not configured correctly.

DEFAULT ACTION

- DTV may not operate correctly. Camera display may not be available.

POSSIBLE CAUSES

Possible Causes
BCM NOT CONFIGURED CORRECTLY BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. VERIFY COMMUNICATION WITH BCM

1. With the scan tool, read the active modules on the bus.

Does the scan tool show the BCM as active on the bus?

Yes

- Go To [3](#)

No

- Perform the No Response From BCM diagnostic procedure. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

3. CHECK BCM FOR ACTIVE DTCS

1. With the scan tool, erase BCM DTCs.
2. Turn the ignition off for a minimum of 10.0 seconds.
3. Turn the ignition on.
4. With the scan tool, read BCM DTCs and record on the repair order.

Are any active DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **STANDARD PROCEDURE** .

No

- Go To [4](#)

4. CHECK THE VEHICLE CONFIGURATION INFORMATION WITH SCAN TOOL

1. With the scan tool run an ECU Details Report, read the Original and Current VINs, and the Body Style of the vehicle.

Does the information displayed match the vehicle?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. PERFORM THE RESTORE VEHICLE CONFIGURATION ROUTINE

1. With the scan tool, perform the Restore Vehicle Configuration routine.
2. Turn the ignition off for a minimum of 10.0 seconds.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED as active?

Yes

- Replace the Body Control Module (BCM) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- The condition or conditions that originally set this DTC are not present at this time. Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** . If no problems are found, test complete.

B22A9-00 - ECU INTERNAL PERFORMANCE

For a complete DIGITAL TV SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Digital TV (DTV) Module detects an internal failure.

DEFAULT ACTION

- TV and cameras unavailable.
- DTV HMI unavailable.
- CAN not available.

POSSIBLE CAUSES

Possible Causes

DIGITAL TV (DTV) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B23C4-12 - SIDE CAMERA-CIRCUIT SHORT TO BATTERY

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Side View Camera circuit is shorted to voltage.

DEFAULT ACTION

- The Side View Camera is unavailable.

POSSIBLE CAUSES

Possible Causes
SIDE VIEW CAMERA CIRCUIT SHORTED TO VOLTAGE SIDE VIEW CAMERA DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE SIDE VIEW CAMERA CONNECTIONS

1. Turn the ignition off.
2. Verify that the Side View Camera connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE SIDE VIEW CAMERA CONNECTOR - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the Side View Camera harness connectors.

NOTE: **The short to voltage DTC should not set. A short to ground DTC should set in the DTV with the cameras disconnected.**

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the short to voltage DTC return?

Yes

- Replace the Side View Cameras.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE SIDE VIEW CAMERA CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DTV Module harness connector.
3. Turn the ignition on.
4. Measure the voltage between ground and the Side View Camera circuits at the DTV Module harness connector.

Is there any voltage present?

Yes

- Repair the Side View Camera circuit(s) for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring or connectors corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B23C4-14 - SIDE CAMERA-CIRCUIT SHORT TO GROUND OR OPEN

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Side View Camera circuit is shorted to ground or open.

DEFAULT ACTION

- The Side View Camera is unavailable.

POSSIBLE CAUSES

Possible Causes
SIDE VIEW CAMERA DISCONNECTED
SIDE VIEW CAMERA CIRCUIT OPEN
SIDE VIEW CAMERA CIRCUIT SHORTED TO GROUND
SIDE VIEW CAMERA
DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE SIDE VIEW CAMERA CONNECTIONS

NOTE: **A disconnected Side Camera will set this DTC.**

1. Turn the ignition off.
2. Verify that the Side View Camera connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE SIDE VIEW CAMERA CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DTV Module harness connector.
3. Disconnect both Side View Camera harness connectors.
4. Check for continuity between ground and the Side View Camera circuits at the DTV harness connector.

Is there continuity between ground and the Side View Camera circuits?

Yes

- Repair the camera circuit(s) for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE SIDE VIEW CAMERA CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. Measure the resistance of the Side View Camera circuits between the DTV Module harness connector and the Side View Camera harness connectors.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Side View Camera circuit(s) for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. REPLACE THE SIDE VIEW CAMERAS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Replace the Side Cameras.
2. Reconnect all harness connectors.
3. With the scan tool, erase DTCs.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Side View Cameras corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring or connectors corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B23C5-12 - FRONT CAMERA-CIRCUIT SHORT TO BATTERY

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Front Camera circuit is shorted to voltage.

DEFAULT ACTION

- The Front Camera is unavailable

POSSIBLE CAUSES

Possible Causes
FRONT CAMERA CIRCUIT SHORTED TO VOLTAGE FRONT CAMERA DIGITAL TV (DTV) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE FRONT CAMERA CONNECTIONS

1. Turn the ignition off.
2. Verify that the Front Camera connections are secure and undamaged.

Are the connection(s) secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT THE FRONT CAMERA CONNECTOR - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect the Front Camera harness connector.

NOTE: **The short to voltage DTC should not set. A short to ground DTC should set in the DTV with the cameras disconnected.**

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the short to voltage DTC return?

Yes

- Replace the Front Camera.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FRONT CAMERA CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DTV Module harness connector.
3. Turn the ignition on.
4. Measure the voltage between ground and the Front Camera circuits at the DTV Module harness connector.

Is there any voltage present?

Yes

- Repair the Front Camera circuit(s) for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connector.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connector.
4. Inspect harness connector, component connector, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connector. Be certain that all harness connector are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connector (if equipped). Be certain that all connector are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connector. Be certain that all connector are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring or connector corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B23C5-14 - FRONT CAMERA-CIRCUIT SHORT TO GROUND OR OPEN

For a complete DIGITAL TV SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Front Camera circuit is shorted to ground or open.

DEFAULT ACTION

- The Front Camera is unavailable

POSSIBLE CAUSES

Possible Causes
FRONT CAMERA DISCONNECTED
FRONT CAMERA CIRCUIT OPEN
FRONT CAMERA CIRCUIT SHORTED TO GROUND
FRONT CAMERA
DIGITAL TV (DTV) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE FRONT CAMERA CONNECTION

NOTE: A disconnected Front Camera will set this DTC.

1. Turn the ignition off.
2. Verify that the Front Camera connection is secure and undamaged.

Is the connection secure and undamaged?

Yes

- Go To [3](#)

No

- Repair the connection(s) as needed.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE FRONT CAMERA CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DTV Module harness connector.
3. Disconnect the Front Camera harness connector.
4. Check for continuity between ground and the Front Camera circuit at the DTV harness connector.

Is there continuity between ground and the Front Camera circuit?

Yes

- Repair the camera circuit(s) for a short to ground.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FRONT CAMERA CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Measure the resistance of the Front Camera circuit between the DTV Module harness connector and the Front Camera harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Front Camera circuit(s) for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. REPLACE THE FRONT CAMERA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Replace the Front Camera.
2. Reconnect all harness connectors.
3. With the scan tool, erase DTCs.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Front Camera corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTV harness connector.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connector.
4. Inspect harness connector, component connector, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTV harness connector. Be certain that all harness connector are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connector (if equipped). Be certain that all connector are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connector. Be certain that all connector are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTV DTCs.

Did the DTC return?

Yes

- Replace the DTV Module.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Repairing the wiring or connector corrected the condition.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

U0010-00-CAN INTERIOR BUS

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable CAN IHS Bus diagnostic tests in the BCM. Refer to [**BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX**](#) .

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0184-00-LOST COMMUNICATION WITH RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

2021 GENERAL INFORMATION

(Driver Presence Detection Module (DPDM) - Electrical Diagnostics) - Gladiator [DP]

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B1B9D-00	BLADDER FLUID LEVEL LOW
B1BA8-00	SYSTEM OUT OF CALIBRATION/NOT CALIBRATED
B2206-00	CURRENT VIN MISSING-MISMATCH
B222A-00	VEHICLE LINE MISMATCH
B22A9-00	ECU INTERNAL PERFORMANCE
B23D4-00	ECU CALIBRATION RANGE PERFORMANCE
U0002-00	CAN C BUS OFF PERFORMANCE
U0140-00	LOST COMMUNICATION WITH THE BODY CONTROL MODULE

DIAGNOSIS AND TESTING

B1B9D-00-BLADDER FLUID LEVEL LOW

For a complete RESTRAINT SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Presence Detection Module (DPDM) monitors the bladder fluid pressure. The DPDM uses pressure data to determine the status (occupied or empty) of the driver's seat and verify the operational status of the bladder. The bladder fluid pressure and temperature are analog measurements and converted to digital counts.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- This DTC will set if the Driver Presence Detection Module (DPDM) detects raw pressure less than 30 counts for more than 60 seconds with the temperature above 0B° C (32B° F).

DEFAULT ACTION

- This DTC will set SNA status for Driver Presence Signal.

POSSIBLE CAUSES

Possible Causes
DRIVER PRESENCE DETECTION MODULE (DPDM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

REPLACE THE DRIVER PRESENCE DETECTION MODULE (DPDM)

1. Make sure the battery is fully charged.

2. Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.
3. With the scan tool, read Driver Presence Detection Module (DPDM) DTCs.

Does the scan tool display this DTC as active?

Yes

- Replace the Driver Presence Detection Module (DPDM) in accordance with Service Information. Refer to **MODULE, DRIVER PRESENCE DETECTION (DPDM), REMOVAL AND INSTALLATION** .
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

No

- Test complete.
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

B1BA8-00-SYSTEM OUT OF CALIBRATION/NOT CALIBRATED

THEORY OF OPERATION

The Driver Presence Detection Module (DPDM), seat cushion, bladder, vent and heater mat are calibrated as one unit in the assembly plant. If this DTC is active, the seat assembly plant did not calibrate the DPDM or the seat assembly plant did not calibrate the Service DPDM/Foam kit or the Re-zero process failed. Go to the DPDM Re-zero procedure portion for instructions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- This DTC will set if the DPDM has not been calibrated as a pair with the foam at the seat assembly plant.

DEFAULT ACTION

- This DTC will set SNA status for Driver Presence Signal.

POSSIBLE CAUSES

Possible Causes
DRIVER PRESENCE DETECTION MODULE (DPDM) NOT CALIBRATED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

VERIFY ACTIVE DTC

NOTE: Make sure the battery is fully charged.

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire

harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
2. Make sure the passenger seat is empty and in the upright position. Make sure the temperature of the seat is lower than 90 degrees F and higher than 35 degrees F.
3. The following DTCs will cause the procedure to fail: B1B9D-00 and/or B2212-00. Follow the instructions for repairing these DTCs before attempting the Empty Seat Relearn procedure.

NOTE: Failure to follow the test instructions or aborting the test causes faults to set when performing the Scan tool Driver Presence Detection Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed, verify that the ignition is in run position. Only press scan tool buttons when directed to do so and perform the scan tool Driver Presence Detection Verification Test to completion.

4. With the scan tool in DPDM, select the Miscellaneous Functions tab on the scan tool, select Empty Seat Value Relearn. Run the test by following the instructions displayed on the scan tool. When the test completes, wait two minutes and then proceed as follows.
5. With the scan tool, read active DTCs.

Does the scan tool display DTC: B1BA8-00-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED as active?

Yes

- Replace the Driver Presence Detection Module in accordance with Service Information. Refer to **MODULE, DRIVER PRESENCE DETECTION (DPDM), REMOVAL AND INSTALLATION**.
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

No

- Test complete.
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

B2206-00-CURRENT VIN MISSING-MISMATCH

THEORY OF OPERATION

During initialization, the Driver Presence Detection Module (DPDM) determines if it has received and agrees with the VIN message which is broadcast on the Bus.

WHEN MONITORED

- Ignition on.

SET CONDITION

- This DTC will set if the DPDM does not receive the VIN information which is broadcast on the Bus or if VIN is different than that stored in DPDM.

POSSIBLE CAUSES

Possible Causes
BCM DTCS OR COMMUNICATION DTCS DRIVER PRESENCE DETECTION MODULE (DPDM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

NOTE: Diagnose and repair any BCM VIN or Communication DTCs before continuing with this procedure.

1. Turn the ignition on.
2. With the scan tool, read Driver Presence Detection Module (DPDM) DTCs.

Does the scan tool display this DTC as active?

Yes

- Verify the correct vehicle configuration is programmed in the BCM.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Use the scan tool to read DTCs in all other modules and verify the Driver Presence Detection Module (DPDM) part number is correct. If any communication DTCs are present, perform the appropriate diagnostic procedure. Perform any Technical Service Bulletins that apply. If no problems are found, replace the Driver Presence Detection Module (DPDM) in accordance with Service Information. Refer to [MODULE, DRIVER PRESENCE DETECTION \(DPDM\), REMOVAL AND INSTALLATION](#).
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to [DRIVER PRESENCE DETECTION MODULE \(DPDM\) VERIFICATION TEST](#).

B222A-00-VEHICLE LINE MISMATCH

THEORY OF OPERATION

During initialization the Driver Presence Detection Module (DPDM) verifies that the vehicle configuration stored matches the data in the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- This DTC sets when the DPDM configuration does not match the vehicle configuration.

DEFAULT ACTION

- This DTC will set fault flag and status to SNA/Undetermined.

POSSIBLE CAUSES

Possible Causes
INCORRECT VIN PROGRAMMED INTO THE BCM
DRIVER PRESENCE DETECTION MODULE (DPDM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

NOTE: Diagnose and repair any BCM VIN or Communication DTCs before continuing with this procedure.

1. Turn the ignition on.
2. With the scan tool, read DTCs.

Does the scan tool display this DTC as active?

Yes

- Verify the correct vehicle configuration is programmed in the BCM.
- Perform the BODY VERIFICATION TEST. Refer to [BODY CONTROL MODULE \(BCM\)- DIAGNOSTIC CODE INDEX](#).

No

- Use the scan tool to read DTCs in all other modules and verify the Driver Presence Detection Module (DPDM) part number is correct. If any communication DTCs are present, perform the appropriate diagnostic procedure. Perform any Technical Service Bulletins that apply. If no problems are found, replace the Driver Presence Detection Module (DPDM) in accordance with Service Information. Refer to [MODULE, DRIVER PRESENCE DETECTION \(DPDM\), REMOVAL AND INSTALLATION](#).
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to [DRIVER PRESENCE DETECTION MODULE \(DPDM\) VERIFICATION TEST](#).

B22A9-00-ECU INTERNAL PERFORMANCE

THEORY OF OPERATION

The DPDM performs self-diagnostics on a continuous basis and will set a DTC when an internal faults are detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- This DTC sets when a fault is detected internal to DPDM hardware and/or software. Once set, this DTC is latched for the entire power cycle. If the same failure is detected in two consecutive power cycles, this DTC is latched active indefinitely.

DEFAULT ACTION

- This DTC will set fault flag and status to SNA/Undetermined.

POSSIBLE CAUSES

Possible Causes
DRIVER PRESENCE DETECTION MODULE (DPDM))

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

REPLACE DRIVER PRESENCE DETECTION MODULE (DPDM)

1. Turn the ignition on.
2. With the scan tool, erase and read Driver Presence Detection Module (DPDM) DTCs.

WARNING: Turn the ignition off disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

When this code is set, view Repair, below.

Repair

- Replace the Driver Presence Detection Module (DPDM) in accordance with Service Information. Refer to **MODULE, DRIVER PRESENCE DETECTION (DPDM), REMOVAL AND INSTALLATION** .
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

B23D4-00-ECU CALIBRATION RANGE PERFORMANCE

THEORY OF OPERATION

The Driver Presence Detection Module (DPDM), seat cushion, bladder, vent and heater mat are calibrated as one unit in the assembly plant. The DPDM will automatically re-calibrate the assembly from time to time to retain the calibrated relationship between the seat, bladder and module as the seat and bladder change due to age and wear. The re-zero Driver Presence Detection Module Test uses a scan tool process called the Driver Presence Detection System Verification Test to force the DPDM to re-calibrate or re-zero. To ensure up to date calibration and functional performance the scan tool Driver Presence Detection System Verification Test is performed during and after servicing the system.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- During the execution of the re-zero process and remains until a successful re-zero process is completed

SET CONDITION

- This DTC will set if the DPDM or the scan tool initiated re-zero failed, the system verification routine was aborted or a update option table from the flash routine was incomplete or missing.

DEFAULT ACTION

- This DTC will set fault flag and status to SNA/Undetermined.

POSSIBLE CAUSES

Possible Causes
SEAT NOT CALIBRATED
OTHER ACTIVE (DPDM) DTCs
DRIVER PRESENCE DETECTION MODULE (DPDM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

VERIFY ACTIVE DTC

NOTE: Make sure the battery is fully charged.

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
2. Make sure the driver's seat is not occupied.
3. If equipped with the keyless ignition, use this ignition on warning.

NOTE: Failure to follow the test instructions or aborting the test causes faults to set when performing the Scan tool Driver Presence Detection System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed, verify that the ignition is in run position. Only press scan tool buttons when directed to do so and perform the scan tool DPDM System Verification Test to completion.

4. With the scan tool in Driver Presence Detection Module (DPDM), select the Miscellaneous Functions tab on the scan tool, select Empty Seat Value Relearn. Run the test by following the instructions displayed on the scan tool. When the test completes, wait two minutes and then proceed as follows.
5. With the scan tool, read active DTCs.

NOTE: Active DTCs will cause the relearn procedure to fail.

Does the scan tool display DTC: B23D4-00-ECU CALIBRATION RANGE PERFORMANCE as active?

Yes

- Recheck connections and perform Calibration Out of Range procedure again. If the Calibration Out of Range procedure fails three consecutive times, replace the Driver Presence Detection Module (DPDM) in accordance with Service Information. Refer to **MODULE, DRIVER PRESENCE DETECTION (DPDM), REMOVAL AND INSTALLATION** .
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

No

- Test complete.
- Perform the DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST. Refer to **DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST**.

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0140-00-LOST COMMUNICATION WITH THE BODY CONTROL MODULE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on for at least five seconds.
- Battery voltage between 10 and 16 volts.

SET CONDITION

- Bus messages not received from the Body Control Module for approximately two to five seconds.

POSSIBLE CAUSES

Possible Causes
CONTROLLER AREA NETWORK (CAN) C BUS (+) CIRCUIT SHORTED TO VOLTAGE
CAN C BUS (-) CIRCUIT SHORTED TO GROUND
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
BODY CONTROL MODULE (BCM) NOT CONFIGURED CORRECTLY
BCM POWER AND GROUND
BCM
MODULE THAT SET THIS DTC

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: For vehicle communication issues, use the scan tool Module Topology, which depicts a high level view of the vehicle networks. Modules without network communication will appear in red.

1. Turn the ignition on.
2. With a scan tool, read DTCs and record on the repair order.
3. Record the Environmental Data.
4. With a scan tool, read DTCs.

Is the DTC active?

Yes

- Perform the NO RESPONSE FROM ECU procedure for the Body Control Module (BCM). Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX**.

No

- Perform the STORED LOST COMMUNICATION DTCs procedure. Refer to the appropriate information.

STANDARD PROCEDURE

EMPTY SEAT RELEARN PROCEDURE

For a complete wiring diagram, refer to appropriate SYSTEM WIRING DIAGRAMS article .

DPDM RELEARN PROCEDURE

EMPTY SEAT RELEARN

NOTE: Make sure the battery is fully charged.

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
2. Make sure the passenger seat is empty and in the upright position. Make sure the temperature of the seat is lower than 32B° C (90B° F) and higher than 2B° C (35B° F).
3. Active DTCs B1B9D-00 and B2212-00 must be repaired before performing Empty Seat Value Relearn procedure.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

NOTE: Failure to follow the test instructions or aborting the test causes faults to set when performing the scan tool Driver Presence Detection Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed, verify that the ignition is in run position. Only press scan tool buttons when directed to do so and perform the scan tool Driver Presence Detection Module System Verification Test to completion.

4. Turn the ignition on.
5. With the scan tool in DPDM, select the Miscellaneous Functions tab on the Scan Tool, select Empty Seat Value Relearn. Run the test by following the instructions displayed on the scan tool. When the test completes, wait two minutes and then proceed.
6. With the scan tool, read active DTCs.

Does the scan tool display any DPDM active DTCs?

Yes

- Perform the appropriate diagnostic procedures. Refer to [DIAGNOSIS AND TESTING](#).

No

- The DPDM Re-zero procedure is complete.
- Perform the DRIVER PRESENCE DETECTION MODULE VERIFICATION TEST. Refer to [DRIVER PRESENCE DETECTION MODULE \(DPDM\) VERIFICATION TEST](#).

DRIVER PRESENCE DETECTION MODULE (DPDM) VERIFICATION TEST

DIAGNOSTIC VERIFICATION TEST

DIAGNOSTIC VERIFICATION TEST

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. VERIFICATION TEST

2. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
3. Turn the ignition on.
4. Connect the scan tool to the Data Link Connector - use the most current software available.
5. With the scan tool erase stored DTCs in the Restraint System or whichever subsystem DTCs set.
6. Turn the ignition off, and wait 15 seconds, then turn the ignition on.
7. Wait one minute, using the scan tool read active subsystem DTCs and if there are none present read the stored codes.
8. If the scan tool shows any active or stored codes, follow path specified for that trouble code. If no active or stored codes are present, the repair is complete.

Are any DTCs present or is the original condition still present?

Yes

- Repair is not complete. Perform the appropriate diagnostic procedure for any DTCs that are set. Refer to [DIAGNOSIS AND TESTING](#).

No

WARNING: Turn the ignition off disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- If equipped with the standard key ignition, use this ignition on warning.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

If equipped with the keyless ignition, use this ignition on warning.

- Perform the DRIVER PRESENCE DETECTION MODULE VERIFICATION TEST. Refer to [DRIVER PRESENCE DETECTION MODULE \(DPDM\) VERIFICATION TEST](#).
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2021 GENERAL INFORMATION

(Drivers Assistance System Module - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1EAD-2A</u>	LANE DEPARTURE WARNING SWITCH-STUCK
<u>C0063-9A</u>	YAW RATE SENSOR-COMPONENT OR SYSTEM OPERATING CONDITIONS
<u>C008E-00</u>	ECU INTERNAL PERFORMANCE
<u>C008F-00</u>	CALIBRATION NOT LEARNED
<u>C1240-00</u>	STEERING ANGLE SENSOR ANGLE OVERTRAVEL PERFORMANCE
<u>C127A-00</u>	ESP DID NOT RESPOND TO DECELERATION REQUEST
<u>C14A3-00</u>	XBW RULE VIOLATION
<u>C14A4-00</u>	SENSOR ADJUSTMENT REQUIRED
<u>C14A5-00</u>	SENSOR BLINDED
<u>C14A6-92</u>	VEHICLE REACTION-PERFORMANCE OR INCORRECT OPERATION
<u>C2129-16</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C2129-17</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>C212A-84</u>	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
<u>C212A-85</u>	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
<u>C2206-00</u>	VEHICLE CONFIGURATION MISMATCH
<u>C2210-00</u>	ECU OVERTEMPERATURE
<u>C2212-00</u>	ECU IN-PLANT MODE
<u>C2223-00</u>	ECU CONFIGURATION MISMATCH
<u>C2225-00</u>	PCM DISABLED ECU
<u>C2226-00</u>	TCM DISABLED ECU
<u>C2227-00</u>	ABS DISABLED ECU
<u>P0585-00</u>	SPEED CONTROL SWITCH 1/2 CORRELATION
<u>P1593-2A</u>	SPEED CONTROL SWITCH 1/2 - STUCK
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM "A"
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0102-00</u>	LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE/AWD
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"
<u>U0131-00</u>	LOST COMMUNICATION WITH POWER STEERING CONTROL MODULE "A"
<u>U0132-00</u>	LOST COMMUNICATION WITH SUSPENSION CONTROL MODULE
<u>U0137-00</u>	LOST COMMUNICATION WITH TRAILER BRAKE CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0151-00</u>	LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)
<u>U0155-00</u>	LOST COMMUNICATION WITH CLUSTER/CCN
<u>U0401-00</u>	INVALID DATA RECEIVED FROM ECM/PCM "A"
<u>U0402-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TCM
<u>U0403-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TCASE
<u>U0415-00</u>	INVALID DATA RECEIVED FROM ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE A

DTC	Description
<u>U0420-00</u>	INVALID DATA RECEIVED FROM POWER STEERING CONTROL MODULE "A"
<u>U0421-00</u>	IMPLAUSIBLE DATA RECEIVED FROM SUSPENSION CONTROL MODULE
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0423-00</u>	IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN
<u>U0429-00</u>	IMPLAUSIBLE DATA RECEIVED FROM STEERING COLUMN CONTROL MODULE
<u>U0438-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TRAILER CONTROL MODULE
<u>U0452-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RESTRAINTS CONTROL MODULE
<u>U110A-00</u>	LOST COMMUNICATION WITH SCM-CAN-C
<u>U115F-00</u>	LOST COMMUNICATION WITH DRIVER PRESENCE DETECTION MODULE
<u>U11F9-00</u>	U11F9-00 - ENGINE DID NOT RESPOND TO ACC TORQUE REQUEST
<u>U121E-00</u>	LOST COMMUNICATION WITH STEERING WHEEL CRUISE CONTROL SWITCH
<u>U141E-00</u>	IMPLAUSIBLE DATA RECEIVED FROM CRUISE CONTROL SWITCH
<u>U1442-00</u>	IMPLAUSIBLE DATA RECEIVED FROM DRIVER PRESENCE DETECTION MODULE
<u>U1600-00</u>	U1600-00 - ECU APPLICATION SOFTWARE MISMATCH

DIAGNOSIS AND TESTING

B1EAD-2A-LANE DEPARTURE WARNING SWITCH-STUCK

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- Module is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The Lane Departure Warning Switch has been activated for more than 60 seconds.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
LANE DEPARTURE WARNING SWITCH
DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR ACTIVE DTCS AFTER REPLACING THE LANE DEPARTURE WARNING SWITCH

1. Turn the ignition off.
2. Replace the Lane Departure Warning Switch in accordance with the Service Information.
3. Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.
4. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.

3. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), REMOVAL AND INSTALLATION**.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.
- Test complete.

C0063-9A-YAW RATE SENSOR-COMPONENT OR SYSTEM OPERATING CONDITIONS

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The yaw rate offset value received over the CAN Bus from the Antilock Brake System (ABS) Module is beyond an allowable threshold of 4 degrees per second for 100 ms.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
ABS MODULE DTCS PRESENT
ABS MODULE NOT INITIALIZED/PROGRAMED

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10 seconds.
5. Start the engine.
6. Park the vehicle on a level surface and allow to idle for a minimum of 10 seconds.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Repair the ABS DTCs. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#).

NOTE: It may be necessary to perform the ABS Initialization routine with the scan tool to reset the vehicle configuration.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

C008E-00-ECU INTERNAL PERFORMANCE

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#).

WHEN MONITORED

- Ignition on.
- System voltage between 10.0 and 16.0 volts.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The module detects an internal failure or hardware performance error.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), REMOVAL AND INSTALLATION** .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

C008F-00-CALIBRATION NOT LEARNED

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

- During module start up.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The module has either not gone through the alignment process or has not completed the alignment process successfully.

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
DASM CALIBRATION NOT COMPLETED SUCCESSFULLY DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. PERFORM THE DRIVER ASSISTANCE SYSTEM MODULE (DASM) - CALIBRATION PROCEDURE

NOTE: A secure and unmodified mounting location is critical to the proper operation of the DASM.

NOTE: Vehicles that have had the suspension modified and/or an aftermarket grill installed that blocks the DASM can cause the DASM to not function properly.

1. Verify that the DASM is correctly installed and aligned in accordance with the service information.
2. With the scan tool, perform the Driver Assistance System Module (DASM) - Calibration Procedure.
3. Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

Does this DTC reset after performing the verification test?

Yes

- Go To [2](#)

No

- Performing the calibration routine corrected the condition.

2. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), REMOVAL AND INSTALLATION** .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.
- Test complete.

C1240-00-STEERING ANGLE SENSOR ANGLE OVERTRAVEL PERFORMANCE

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)

- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The steering angle offset value received over the Can Bus from the Steering Column Control Module (SCCM) is beyond an allowable threshold of 12 degrees for 100 ms.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM) DTCS PRESENT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN AFTER TEST DRIVING THE VEHICLE AND ALLOWING IT TO IDLE FOR 10 SECONDS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Test drive the vehicle.
6. Park the vehicle on a level surface and allow it to sit for at least 10.0 seconds.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Repair the SCCM DTCs. Refer to **DIAGNOSIS AND TESTING** .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

C127A-00-ESP DID NOT RESPOND TO DECELERATION REQUEST

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The ESP/ESC does not react to a deceleration request from the ACC module within 760 ms.

DEFAULT ACTION

- ACC system is disabled.

POSSIBLE CAUSES

Possible Causes
CONFIGURATION, COMMUNICATION OR OTHER DTCS SET IN THE ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN AFTER TEST DRIVING THE VEHICLE AND ALLOWING IT TO IDLE FOR 10 SECONDS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Test drive the vehicle.
6. Park the vehicle on a level surface and allow it to idle for at least 10.0 seconds.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- This DTC is an indication that there are configuration, communication or other DTCs set in the ABS module.
- Perform the appropriate diagnostic procedure(s). Refer to [**ANTILOCK BRAKE SYSTEM \(ABS\)-
DIAGNOSTIC CODE INDEX**](#) .

NOTE: It may be necessary to perform the ABS Initialization routine with the scan tool to reset the vehicle configuration.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

C14A3-00-XBW RULE VIOLATION

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [**MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The module detects a sudden, externally induced acceleration or deceleration or a DTC in another module.

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
DTCS PRESENT IN OTHER MODULE(S) BRAKE SYSTEM NOT FUNCTIONING PROPERLY SUDDEN ACCELERATION OR DECELERATION ACCIDENT OCCURRED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR DTCS SET IN OTHER MODULE(S) OR BRAKE SYSTEM MALFUNCTION

NOTE: This DTC cannot be caused without faults elsewhere, other than deceleration/acceleration induced externally (e.g. driving in sand or an accident).

1. Refer to the saved DTC information recorded on the repair order.
2. Repair any DTCs set in the ABS, PCM and/or TCM in accordance with the service information.
3. Check the functionality of the brake system in accordance with the service information.

Repair

- Repair as necessary.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

C14A4-00-SENSOR ADJUSTMENT REQUIRED

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- System voltage between 10.0 and 16.0 volts.

SET CONDITION

- The module detects that the radar or camera sensor is misaligned.

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
RADAR OR CAMERA SENSOR MISALIGNED RADAR OR CAMERA SENSOR MOUNTING HARDWARE DAMAGED, BROKEN OR BENT DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: When servicing the DASM, it is recommended to obtain the environmental conditions when the concern took place from the customer. Heavy rain, snow, ice, and fog can cause the DASM to become inoperative. This is

considered as a normal operational reaction of the DASM and no repair is necessary.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. INSPECT DASM MOUNTING AND LENS ALIGNMENT

NOTE: A secure and unmodified mounting location is critical to the proper operation of the DASM.

NOTE: Vehicles that have had the suspension modified and/or an aftermarket grill installed that blocks the DASM can cause the DASM to not function properly.

1. Perform a thorough visual and physical inspection of the DASM and the mounting bracket and location.
2. Check for:
 - Bent mounting bracket
 - Damage to the DASM
 - Damaged, obscured, or out of alignment lens
 - DASM not fully seated or broken/missing securing clips

Were there any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Replace the DASM Sensor only if visible damage is present, then replace the bracket and sensor assembly. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), REMOVAL AND INSTALLATION](#).
- Perform the DASM alignment procedure in accordance with the Service Information.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

C14A5-00-SENSOR BLINDED

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- System voltage between 10.0 and 16.0 volts.
- DASM is not in Plant-Mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The module detects that the radar or camera sensor is obstructed, damaged or vertically misaligned.

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
RADAR OR CAMERA SENSOR OBSTRUCTED OR DAMAGED
RADAR OR CAMERA SENSOR MOUNTING HARDWARE DAMAGED, BROKEN OR BENT
RADAR OR CAMERA SENSOR MISALIGNED;
DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: When servicing the DASM, it is recommended to obtain the environmental conditions when the concern took place from the customer. Heavy rain, snow, ice, and fog can cause the DASM to become inoperative. This is considered as a normal operational reaction of the DASM and no repair is necessary.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. INSPECT DASM MOUNTING AND LENS ALIGNMENT

NOTE: A secure and unmodified mounting location is critical to the proper operation of the DASM.

NOTE: Vehicles that have had the suspension modified or aftermarket parts installed that block the DASM can cause the DASM to not function properly.

NOTE: Make sure the DASM Sensor lens area is free from any obstruction that would compromise the function of the DASM.

1. Perform a thorough visual and physical inspection of the DASM and the mounting location.
2. Check for:
 - Damage to the DASM
 - Lens damaged, obscured, or out of alignment
 - DASM mounted incorrectly or broken/missing mounting hardware

Were there any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

No

- Align the DASM in accordance to the Service Information. If the alignment is correct, and the DTC continues to set, Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), REMOVAL AND INSTALLATION](#) .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).
- Test complete.

C14A6-92-VEHICLE REACTION-PERFORMANCE OR INCORRECT OPERATION

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- After requesting acceleration or deceleration, the module detects that the rate of acceleration or deceleration is either greater than, less than, or not within the specified range when requested.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
DTCS PRESENT IN OTHER MODULE(S)
VEHICLE CONFIGURATION INCORRECT

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

CHECK FOR ACTIVE DTCS

NOTE: When servicing the DASM, it is recommended to obtain the environmental conditions when the concern took place from the customer. Heavy rain, snow, ice, and fog can cause the DASM to become inoperative. This is considered as a normal operational reaction of the DASM and no repair is necessary.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

Are any other modules reporting DTCs?

Yes

- Refer to the appropriate diagnostic procedure and repair as necessary.

No

- This is an informational DTC.
- Check for proper operation of all supporting systems, such as engine, transmission and braking systems.
- Verify that all vehicle supporting systems are properly configured.
- A vehicle collision can cause this DTC to set.
- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

C2129-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Engine running.
- Engine not cranking.
- DASM is not in Plant-Mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The monitored voltage to the module is below 9.0 volts for 250 ms.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE LOW
BATTERY VOLTAGE LOW
FUSED IGNITION CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM OR BATTERY VOLTAGE DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any charging system or battery voltage DTCs set in the PCM?

Yes

- Repair the DTCs set in the PCM and retest. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. ISOLATE AND LOAD TEST (F916) FUSED IGNITION RUN/START CIRCUIT TO CHECK FOR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.

3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

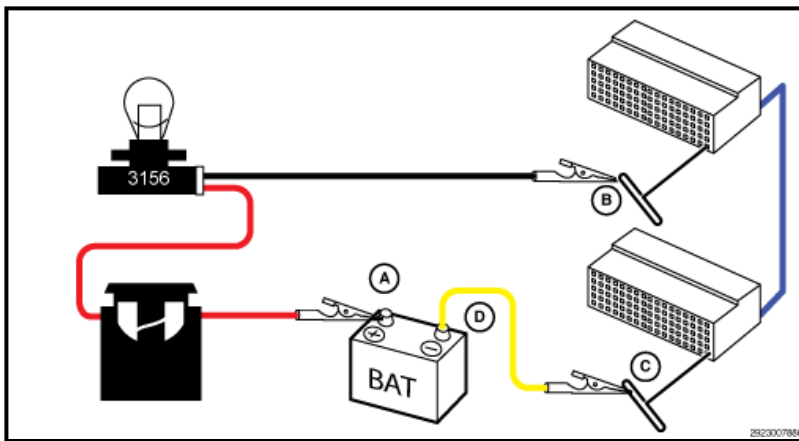
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



WARNING: To avoid possible serious or fatal injury, DO NOT load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

4. CHECK THE (Z910) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load

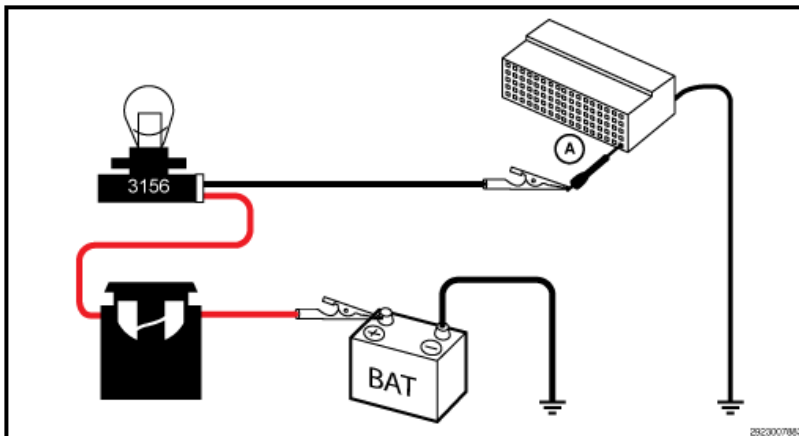
testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), REMOVAL AND INSTALLATION**.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

TEST.

- Test complete.

C2129-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information .**

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION .**

WHEN MONITORED

- Engine running.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.

SET CONDITION

- The monitored voltage to the module is above 16.0 volts for 250 ms.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE HIGH BATTERY VOLTAGE HIGH GROUND CIRCUIT HIGH RESISTANCE DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR CHARGING SYSTEM OR BATTERY VOLTAGE DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any charging system or battery voltage DTCs set in the PCM?

Yes

- Repair the DTCs set in the PCM and retest. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#), or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK FOR SYSTEM VOLTAGE DTCS SET IN OTHER MODULES

1. Refer to the saved DTC information recorded on the repair order.

Were any system voltage DTCs set in other modules?

Yes

- This is an indication of a charging system or battery malfunction. Check the battery and charging system in accordance with the Service Information.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE (Z910) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

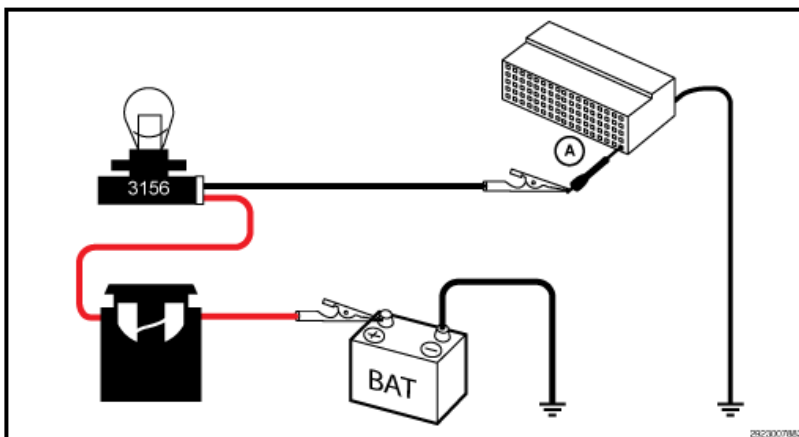
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), REMOVAL AND INSTALLATION**.

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).
- Test complete.

C212A-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [**MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

- Engine running.
- Engine not cranking.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The voltage value that the module receives over the CAN Bus from the BCM is less than or equal to 10.0 volts for 15 seconds or more.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE LOW
BODY CONTROL MODULE (BCM) VOLTAGE LOW

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .**

DIAGNOSTIC TEST

CHECK POWERTRAIN CONTROL MODULE (PCM) DTCS

1. With the scan tool, read PCM DTCS and record on the repair order.

Are there any PCM Charging or Battery DTCS present?

Yes

- Repair the PCM DTCS. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- This DTC is a CAN system message for information only. Check the charging system in accordance with the Service Information.

C212A-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Engine running.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The voltage value that the module receives over the CAN Bus from the BCM is greater than or equal to 16.0 volts for 15 seconds or more.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE HIGH
BODY CONTROL MODULE (BCM) VOLTAGE HIGH

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR POWERTRAIN CONTROL MODULE (PCM) RELATED DTCS

1. With the scan tool, read Powertrain Control Module (PCM) DTCs and record on the repair order.

Are there any PCM charging or battery DTCs present?

Yes

- Repair the PCM DTCs. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- This DTC is a CAN system message for information only. Check the charging system in accordance with the Service Information.

C2206-00-VEHICLE CONFIGURATION MISMATCH

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- Learned vehicle configuration does not match to current vehicle configuration transmitted over CAN.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
VEHICLE CONFIGURATION NOT STORED CORRECTLY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Start the engine.
6. Park the vehicle on a level surface and allow to idle for a minimum of 10 seconds.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR DTCS SET IN OTHER MODULES

1. Refer to the saved DTC information recorded on the repair order.

Were any DTCs set in other modules?

Yes

- Diagnose and repair any DTCs set in other modules and retest.

No

- Go To [3](#)

3. VERIFY VEHICLE CONFIGURATION

1. This DTC indicates that the vehicle configuration is incomplete or incorrect.
2. Check vehicle configuration for any of the following conditions:
 - Vehicle Identification Number (VIN) not valid.
 - VIN mismatch.
 - Vehicle line, body style, engine displacement, fuel type, XWD type, axle ratio, transmission type, FCW/CMS configuration from CAN Bus doesn't match vehicle parameter set as specified and learned in Plant Mode.
 - Country code does not match.
 - Model year does not match.

Repair

- Perform the In-Plant Mode service procedure to learn new vehicle configuration. Exit In-Plant mode with correct configuration data being sent over CAN. Cycle the ignition.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

C2210-00-ECU OVERTEMPERATURE

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [**MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

- Ignition on.
- System voltage between 10.0 and 16.0 volts.

SET CONDITION

- The internal module temperature has exceeded the maximum operating temperature for 60 seconds.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
AMBIENT TEMPERATURE TOO HIGH DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#).

2. VERIFY AMBIENT TEMPERATURE READING

1. With the scan tool, read ambient air temperature in the Powertrain Control Module (PCM).

Is the ambient air temperature reading 85B° C (185B° F) or above?

Yes

- The Driver Assistance System Module (DASM) has detected the ambient temperature above operating range. Once the temperature has decreased below 85B°C (185B°F), DASM operation will be restored.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

- Repair any conditions that are found.
6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
 7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
 8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
 9. With the scan tool, erase DTCs.
 10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
 11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), REMOVAL AND INSTALLATION**.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.
- Test complete.

C2212-00-ECU IN-PLANT MODE

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION**.

WHEN MONITORED

- Ignition on.
- System voltage between 10.0 and 16.0 volts.

SET CONDITION

- In-Plant mode is active in the module.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
MODULE IN-PLANT MODE IS ACTIVE
VEHICLE NOT CONFIGURED OR CONFIGURED INCORRECTLY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- No repair is necessary. Make sure the lens is free of dirt, damage, and other obstructions that would hinder the performance of the DASM lens. Clear the DTC and verify proper operation of the DASM.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

2. CHECK FOR RELATED DTCS SET IN OTHER MODULES

1. Refer to the saved DTC information recorded on the repair order.

Were any vehicle configuration related DTCs set in other modules?

Yes

- Diagnose and repair any related DTCs set in other modules and retest.

No

- Go To [3](#)

3. CHECK VEHICLE CONFIGURATION

1. Check vehicle configuration for any of the following conditions:

- The Vehicle Identification Number (VIN) is not valid.
- VIN mismatch.
- Vehicle line, body style, engine displacement, fuel type, XWD type, axle ratio, transmission type, FCW/CMS configuration from CAN Bus doesn't match vehicle parameter set as specified and learned in Plant Mode.
- Country code does not match.
- Model year does not match.
- Vehicle is not configured to be equipped with DASM.

Were any configuration problems found?

Yes

- Perform the In-Plant Mode service procedure to learn new vehicle configuration. Exit In-Plant mode with correct configuration data being sent over the CAN Bus. Cycle the ignition OFF, then to ON, engine not running.

NOTE: **Engine RPM must be equal to zero (IGN=RUN, engine not running) in order for new configurations to be learned.**

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

No

- With the scan tool, perform the DASM Aim Mode Auto Alignment procedure.

NOTE: **Performing the DASM Aim Mode Auto Alignment procedure will remove the Module from the In-Plant mode.**

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

C2223-00-ECU CONFIGURATION MISMATCH

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information .**

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- Body Control Module (BCM) does not expect the DASM module to be present.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
VEHICLE CONFIGURATION INCORRECT

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: **This DTC will set if the Body Control Module (BCM) is not configured for Driver Assistance System Module (DASM).**

1. Turn the ignition on.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. Record any Freeze Frame or Environmental Data related to the DTCs.

Is the DTC active?

Yes

- With the scan tool, perform a vehicle configuration routine.
- Verify that the DASM alignment is correct. Perform the DASM Alignment procedure.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

No

- No repair is necessary. Clear the DTC and verify proper operation of the DASM.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

C2225-00-PCM DISABLED ECU

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [**MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- An active DTC is set in the Powertrain Control Module (PCM).

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
PCM NOT READY FOR DASM OPERATION PCM DTC(S) PRESENT PCM IN LIMP-IN MODE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

CHECK FOR POWERTRAIN CONTROL MODULE (PCM) DTCS

This Diagnostic Trouble Code (DTC) will set if a DTC is detected in the PCM.

- Repair the PCM DTCs. Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) , or [**3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX**](#) .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

C2226-00-TCM DISABLED ECU

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- An active DTC is set in the Transmission Control Module (TCM)

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
TCM NOT READY FOR DASM OPERATION
TCM DTC(S) PRESENT
TCM IN LIMP-IN MODE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

CHECK FOR TRANSMISSION CONTROL MODULE (TCM) DTCS

This Diagnostic Trouble Code (DTC) will set if a DTC is detected in the TCM.

- Repair the TCM DTCs. Refer to 3.0L DIESEL - DIAGNOSTIC CODE INDEX , or 3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST.

C2227-00-ABS DISABLED ECU

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No CAN Bus DTCs present.
- DASM is not in Plant-Mode.
- Electronic Stability Program (ESP) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- An active DTC is set in the Antilock Brake System (ABS) Module.

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
ABS MODULE NOT READY FOR DASM OPERATION
ABS MODULE DTC(S) PRESENT
ESP IS DISABLED

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR ANTILOCK BRAKE SYSTEM (ABS) MODULE DTCS

This Diagnostic Trouble Code (DTC) will set if a DTC is detected in the ABS module.

- Repair the ABS DTCs. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST**.

P0585-00-SPEED CONTROL SWITCH 1/2 CORRELATION

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No Bus DTCs present.
- Module is not in Plant-Mode.
- Electronic Stability Control (ESC) is not in diagnostic mode.
- Adaptive Cruise Control (ACC), Forward Collision Warning (FCW) or Lane Departure Warning (LDW) system(s) are enabled.

SET CONDITION

- The module receives a Bus message from the Steering Column Control Module (SCCM) that the Speed Control Switch is not functioning properly.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
SPEED CONTROL SWITCH
SCCM DTC(S) PRESENT

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE BODY CONTROL MODULE (BCM) FOR RELATED DTCS

1. With the scan tool, read BCM DTCs.

Are there any BCM DTCs present?

Yes

- Repair the BCM DTCs. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK SPEED CONTROL SWITCH OPERATION

1. With the scan tool, read the Speed Control Switch status under the Steering Column Control Module (SCCM) while pressing switch multiple positions.

Does the switch positions change correctly in the scan tool?

Yes

- Inspect the wiring and connectors between the SCCM and the Speed Control Switch and the output to the BCM for any possible problems. If no problems are found, replace and program the SCCM in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#) .

No

- Inspect the wiring and connectors between the SCCM and the Speed Control Switch. If no problems are found, replace the Speed Control Switch in accordance with the Service Information. Refer to [**SWITCH, SPEED CONTROL, REMOVAL AND INSTALLATION**](#) .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

P1593-2A-SPEED CONTROL SWITCH 1/2 - STUCK

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to [**MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), DESCRIPTION AND OPERATION**](#) .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- No Bus DTCs present.
- Module is not in Plant-Mode.
- Electronic Stability Control (ESC) is not in diagnostic mode.
- Adaptive Cruise Control (ACC), Forward Collision Warning (FCW) or Lane Departure Warning (LDW) system(s) are enabled.

SET CONDITION

- The Bus message from the Steering Column Control Module (SCCM) indicates that the Speed Control Switch has been pressed for 120 seconds or more.

DEFAULT ACTION

- ACC, FCW and LDW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
SPEED CONTROL SWITCH STUCK SPEED CONTROL SWITCH

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE BODY CONTROL MODULE (BCM) FOR RELATED DTCS

1. With the scan tool, read BCM DTCs.

Are there any BCM DTCs present?

Yes

- Repair the BCM DTCs. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK SPEED CONTROL SWITCH OPERATION

1. With the scan tool, read the Speed Control Switch status under the Steering Column Control Module (SCCM) while pressing multiple switch positions.

Does the switch positions change correctly in the scan tool?

Yes

- Inspect the wiring and connectors between the SCCM and the Speed Control Switch and the output to the BCM for any possible problems. If no problems are found, replace and program the SCCM in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

No

- Inspect the wiring and connectors between the SCCM and the Speed Control Switch. If no problems are found, replace the Speed Control Switch in accordance with the Service Information. Refer to [**SWITCH, SPEED CONTROL, REMOVAL AND INSTALLATION**](#).
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [**DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST**](#).

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [**BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX**](#).

U0100-00-LOST COMMUNICATION WITH ECM/PCM "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#).

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#).

U0102-00-LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE/AWD

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#).

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#).

U0131-00-LOST COMMUNICATION WITH POWER STEERING CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#).

U0132-00-LOST COMMUNICATION WITH SUSPENSION CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to

COMMUNICATION DIAGNOSTIC PROCEDURE .

U0137-00-LOST COMMUNICATION WITH TRAILER BRAKE CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0151-00-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0155-00-LOST COMMUNICATION WITH CLUSTER/CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0401-00-INVALID DATA RECEIVED FROM ECM/PCM "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0402-00-IMPLAUSIBLE DATA RECEIVED FROM TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0403-00-IMPLAUSIBLE DATA RECEIVED FROM TCASE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0415-00-INVALID DATA RECEIVED FROM ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE A

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0420-00-INVALID DATA RECEIVED FROM POWER STEERING CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE .**

U0421-00-IMPLAUSIBLE DATA RECEIVED FROM SUSPENSION CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0423-00-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0429-00-IMPLAUSIBLE DATA RECEIVED FROM STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0438-00-IMPLAUSIBLE DATA RECEIVED FROM TRAILER CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0452-00-IMPLAUSIBLE DATA RECEIVED FROM RESTRAINTS CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U110A-00-LOST COMMUNICATION WITH SCM-CAN-C

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U115F-00-LOST COMMUNICATION WITH DRIVER PRESENCE DETECTION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U11F9-00 - ENGINE DID NOT RESPOND TO ACC TORQUE REQUEST

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)

- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to **MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Engine running.
- System voltage between 10.0 and 16.0 volts.
- Module is not in Plant-Mode.
- Electronic Stability Control (ESC) is not in diagnostic mode.
- ACC, FCW or LDW system(s) are enabled.

SET CONDITION

- The Powertrain Control Module (PCM) is not responding to Driver Assistance System Module (DASM) module torque request.

DEFAULT ACTION

- ACC system is disabled.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) DTC(S) PRESENT
PCM DTC(S) PRESENT
PCM IMPROPERLY CONFIGURED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. This is an informational Diagnostic Trouble Code (DTC). The Driver Assistance System Module (DASM) communicates over the CAN Bus with the Powertrain Control Module (PCM) to increase engine speed when needed. If other DASM DTCs are present, perform their respective diagnostic procedures first.
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 10 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- No repair is necessary. Make sure the lens is free of dirt, damage, and other obstructions that would hinder the performance of the DASM imager lens. Clear the DTC and verify proper operation of the DASM.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

2. CHECK FOR DTCS SET IN OTHER MODULES

Check for:

- PCM DTCs present.
- PCM improperly configured.
- BCM DTCs present.
- BCM improperly configured.
- Implausible DTCs against the PCM.
- Any Service Bulletins that may apply.

Were any of the above conditions present?

Yes

- Refer to the appropriate diagnostic procedure and repair/reprogram as necessary.
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

No

- Erase this DTC and perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION TEST](#).

U121E-00-LOST COMMUNICATION WITH STEERING WHEEL CRUISE CONTROL SWITCH

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U141E-00-IMPLAUSIBLE DATA RECEIVED FROM CRUISE CONTROL SWITCH

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1442-00-IMPLAUSIBLE DATA RECEIVED FROM DRIVER PRESENCE DETECTION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1600-00 - ECU APPLICATION SOFTWARE MISMATCH

For a complete ADAPTIVE SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Driver Assistance System Module (DASM) integrates radar and camera sensors into a single unit and is used to detect objects near a vehicle. The module communicates with other modules on the vehicle to provide a system of enhanced safety functions.

- Conventional Cruise Control
- Adaptive Cruise Control (ACC)
- Automatic High Beam Control (AHBC)
- Lane Departure Warning (LDW)
- Advanced Emergency Braking (AEB)
- Forward Collision Warning (FCW)

For an in-depth explanation of the DASM system. Refer to MODULE, DRIVERS ASSISTANCE SYSTEM (DASM), DESCRIPTION AND OPERATION .

WHEN MONITORED

- One time during an ignition cycle.

SET CONDITION

- The Driver Assistance System Module (DASM) was reprogrammed with a corrupted flash file, or the reprogramming of the DASM was interrupted before it was complete.

DEFAULT ACTION

- ACC and FCW system(s) are disabled.

POSSIBLE CAUSES

Possible Causes
DASM NOT PROGRAMMED PROPERLY DRIVER ASSISTANCE SYSTEM MODULE (DASM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- This is an indication that the software installed on the vehicle is corrupted, incorrect or the flash procedure was interrupted. Flash the controller, making sure the correct flash file is used. If this DTC continues to set after flashing at least three times, Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK RELATED HARNESS CONNECTIONS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Disconnect all DASM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all DASM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read DASM DTCs.

Did the DTC return?

Yes

- Replace the Driver Assistance System Module (DASM) in accordance with the Service Information. Refer to [MODULE, DRIVERS ASSISTANCE SYSTEM \(DASM\), REMOVAL AND INSTALLATION](#) .
- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to [DRIVER ASSISTANCE SYSTEM MODULE \(DASM\) VERIFICATION](#)

TEST.

No

- Perform the DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST. Refer to **DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST.**
- Test complete.

STANDARD PROCEDURE

DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST

DIAGNOSTIC TEST

DRIVER ASSISTANCE SYSTEM MODULE (DASM) VERIFICATION TEST

1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
2. With the scan tool, erase DASM DTCs.
3. Make sure that all accessories are turned off and that the battery is fully charged.
4. If the DASM was replaced or moved in any way, the DASM must be aligned. Perform the alignment procedure in accordance with the Service Information.
5. Test drive the vehicle and verify proper operation.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Repair the DASM DTC(s). Refer to **DIAGNOSIS AND TESTING.**

No

- Repair is complete.
-

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - Diagnostic Code Index - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>C1403-11</u>	TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO GROUND
<u>C1403-15</u>	TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>C1403-92</u>	TRANSFER CASE RANGE POSITION SENSOR-PERFORMANCE OR INCORRECT OPERATION
<u>C1406-11</u>	TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO GROUND
<u>C1406-15</u>	TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
<u>C1406-92</u>	TRANSFER CASE BRAKE CONTROL-PERFORMANCE OR INCORRECT OPERATION
<u>C140A-11</u>	TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO GROUND
<u>C140A-12</u>	TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO BATTERY
<u>C140A-13</u>	TRANSFER CASE MOTOR CONTROL-CIRCUIT OPEN
<u>C140A-4B</u>	TRANSFER CASE MOTOR CONTROL-OVER TEMPERATURE
<u>C140E-00</u>	TRANSFER CASE MOTOR BLOCKED
<u>C1412-11</u>	TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO GROUND
<u>C1412-15</u>	TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN
<u>C1415-92</u>	TRANSFER CASE MOTOR CURRENT-PERFORMANCE OR INCORRECT OPERATION
<u>C1416-11</u>	FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND
<u>C1416-12</u>	FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY
<u>C1416-13</u>	FRONT DIFFERENTIAL CONTROL-CIRCUIT OPEN
<u>C141C-11</u>	REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND
<u>C141C-12</u>	REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY
<u>C141C-13</u>	REAR DIFFERENTIAL CONTROL-CIRCUIT OPEN
<u>C1438-00</u>	TRANSFER CASE DIFFERENTIAL CLUTCH WORN
<u>C1444-00</u>	T-CASE MOTOR OVERUSE
<u>C144D-11</u>	FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND
<u>C144D-15</u>	FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>C144D-64</u>	FRONT DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE
<u>C1451-11</u>	REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND
<u>C1451-15</u>	REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
<u>C1451-64</u>	REAR DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE
<u>C1463-11</u>	FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO GROUND
<u>C1463-12</u>	FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO BATTERY
<u>C1463-13</u>	FRONT AXLE DISCONNECT CONTROL-CIRCUIT OPEN
<u>C1477-4B</u>	TRANSFER CASE CLUTCH-OVER TEMPERATURE

DTC	Description
<u>C147B-12</u>	FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO BATTERY
<u>C147B-14</u>	FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO GROUND OR OPEN
<u>C147B-92</u>	FRONT AXLE DISCONNECT SENSOR-PERFORMANCE OR INCORRECT OPERATION
<u>C147E-11</u>	FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO GROUND
<u>C147E-12</u>	FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO BATTERY
<u>C149D-00</u>	CLUTCH CALIBRATION NOT LEARNED
<u>C149E-11</u>	TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO GROUND
<u>C149E-12</u>	TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO BATTERY
<u>C149E-13</u>	TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT OPEN
<u>C149E-64</u>	TRANSFER CASE MOTOR POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE
<u>C149E-94</u>	TRANSFER CASE MOTOR POSITION SENSOR-UNEXPECTED OPERATION
<u>C14AA-11</u>	TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO GROUND
<u>C14AA-12</u>	TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO BATTERY
<u>C14AA-13</u>	TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT OPEN
<u>C2129-16</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C2129-17</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>C2201-00</u>	FDCM-DTCM INTERNAL
<u>C2206-00</u>	VEHICLE CONFIGURATION MISMATCH
<u>U0001-00</u>	CAN C BUS
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0212-00</u>	LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE
<u>U0401-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM
<u>U0402-00</u>	INVALID DATA RECEIVED FROM TCM
<u>U0415-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ABS
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0429-00</u>	IMPLAUSIBLE DATA RECEIVED FROM SCM

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - Diagnostic Code Index - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
C1403-11	TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO GROUND
C1403-15	TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
C1403-92	TRANSFER CASE RANGE POSITION SENSOR-PERFORMANCE OR INCORRECT OPERATION
C1406-11	TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO GROUND
C1406-15	TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN
C1406-92	TRANSFER CASE BRAKE CONTROL-PERFORMANCE OR INCORRECT OPERATION
C140A-11	TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO GROUND
C140A-12	TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO BATTERY
C140A-13	TRANSFER CASE MOTOR CONTROL-CIRCUIT OPEN
C140A-4B	TRANSFER CASE MOTOR CONTROL-OVER TEMPERATURE
C140E-00	TRANSFER CASE MOTOR BLOCKED
C1412-11	TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO GROUND
C1412-15	TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN
C1415-92	TRANSFER CASE MOTOR CURRENT-PERFORMANCE OR INCORRECT OPERATION
C1416-11	FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND
C1416-12	FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY
C1416-13	FRONT DIFFERENTIAL CONTROL-CIRCUIT OPEN
C141C-11	REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND
C141C-12	REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY
C141C-13	REAR DIFFERENTIAL CONTROL-CIRCUIT OPEN
C1438-00	TRANSFER CASE DIFFERENTIAL CLUTCH WORN
C1444-00	T-CASE MOTOR OVERUSE
C144D-11	FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND
C144D-15	FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
C144D-64	FRONT DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE
C1451-11	REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND
C1451-15	REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
C1451-64	REAR DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE
C1463-11	FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO GROUND
C1463-12	FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO BATTERY
C1463-13	FRONT AXLE DISCONNECT CONTROL-CIRCUIT OPEN
C1477-4B	TRANSFER CASE CLUTCH-OVER TEMPERATURE

DTC	Description
<u>C147B-12</u>	FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO BATTERY
<u>C147B-14</u>	FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO GROUND OR OPEN
<u>C147B-92</u>	FRONT AXLE DISCONNECT SENSOR-PERFORMANCE OR INCORRECT OPERATION
<u>C147E-11</u>	FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO GROUND
<u>C147E-12</u>	FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO BATTERY
<u>C149D-00</u>	CLUTCH CALIBRATION NOT LEARNED
<u>C149E-11</u>	TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO GROUND
<u>C149E-12</u>	TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO BATTERY
<u>C149E-13</u>	TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT OPEN
<u>C149E-64</u>	TRANSFER CASE MOTOR POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE
<u>C149E-94</u>	TRANSFER CASE MOTOR POSITION SENSOR-UNEXPECTED OPERATION
<u>C14AA-11</u>	TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO GROUND
<u>C14AA-12</u>	TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO BATTERY
<u>C14AA-13</u>	TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT OPEN
<u>C2129-16</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C2129-17</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>C2201-00</u>	FDCM-DTCM INTERNAL
<u>C2206-00</u>	VEHICLE CONFIGURATION MISMATCH
<u>U0001-00</u>	CAN C BUS
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0212-00</u>	LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE
<u>U0401-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM
<u>U0402-00</u>	INVALID DATA RECEIVED FROM TCM
<u>U0415-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ABS
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0429-00</u>	IMPLAUSIBLE DATA RECEIVED FROM SCM

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - DTCS C1403-11 To C1463-13 - Gladiator

DTC TROUBLESHOOTING

C1403-11-TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Transfer Case Range Position Sensor (RPS) is a serviceable component located on the top center of the Transfer Case next to the vent tube. There are two circuits between the sensor and the (DTCM) Drivetrain Control Module:

- Signal
- Sensor Ground

The RPS is a five-position, resistive type sensor. The sensor contains a plunger that contacts the sector plate inside the Transfer Case which has four discrete positions. The plunger moves in and out of the sensor body as the Transfer Case is shifted. As the plunger is depressed, the resistance value changes.

The sensor ground is used as a low voltage reference. The signal circuit feeds an analog input to the Drivetrain Control Module (DTCM) using a pull-up resistor to 5 volts. The resulting voltage value for each position is read by the DTCM to determine the Transfer Case range position. The voltage is also used by the DTCM software for diagnostic purposes.

TRANSFER CASE RANGE POSITION VS SIGNAL VOLTAGE

Range Position	Minimum voltage	Nominal Voltage	Maximum Voltage
2WD	3.336	3.517	3.682
4WD HIGH/4WD-AUTO	2.713	2.893	3.061
Neutral	1.356	1.491	1.633
4WD LOW	0.482	0.556	0.654

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1, 124.2 Ω	1, 183.4 Ω	1, 242.6 Ω
4WD HIGH/4WD-AUTO	650.18 Ω	684.4 Ω	718.6 Ω
Neutral	199.9 Ω	210.4 Ω	220.9 Ω
4WD LOW	57.4 Ω	60.4 Ω	63.4 Ω

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after engine crank.
- No Sensor Supply DTCs set.
- No Under/Over voltage DTCs set.
- Battery voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- Transfer Case Range Position Signal circuit voltage is below 0.305 volt for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING:
 - **DHF/DHP** : Lock the clutch if last known position is in 4WD. If failed in 2WD, maintain clutch open position.
 - **DHN/DHW** : No action.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR:
 - **DHF/DHP** : Maintain last engage/disengage position.
 - **DHN/DHW** : Engage when condition is safe (zero vehicle speed).
- FRONT AXLE LOCKER ACTUATOR: Maintain position if locked, allow customer selected disengagement. Don't allow re-lock
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
RANGE POSITION SENSOR (RPS)
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to

follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE RANGE POSITION SENSOR (RPS)

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1124.2Ω	1183.4Ω	1242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

1. Disconnect the RPS harness connector.
2. Measure the resistance across the Signal and Ground terminals at the sensor while moving the Transfer Case Shifter to all four positions. Note the resistance reading for each position.

Is the resistance within specification for each position?

Yes

- Go To [4](#)

No

- Replace the RPS in accordance with the Service Information. Refer to the appropriate service information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1403-15-TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Range Position Sensor (RPS) is a serviceable component located on the top center of the Transfer Case next to the vent tube. There are two circuits between the sensor and the (DTCM) Drivetrain Control Module:

- Signal
- Sensor Ground

The RPS is a five-position, resistive type sensor. The sensor contains a plunger that contacts the sector plate inside the Transfer Case which has four discrete positions. The plunger moves in and out of the sensor body as the Transfer Case is shifted. As the plunger is depressed, the resistance value changes.

The sensor ground is used as a low voltage reference. The signal circuit feeds an analog input to the Drivetrain Control Module (DTCM) using a pull-up resistor to 5 volts. The resulting voltage value for each position is read by the DTCM to determine the Transfer Case range position. The voltage is also used by the DTCM software for diagnostic purposes.

TRANSFER CASE RANGE POSITION VS SIGNAL VOLTAGE

Range Position	Minimum voltage	Nominal Voltage	Maximum Voltage
2WD	3.336	3.517	3.682
4WD HIGH/4WD-AUTO	2.713	2.893	3.061
Neutral	1.356	1.491	1.633
4WD LOW	0.482	0.556	0.654

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1, 124.2Ω	1, 183.4Ω	1, 242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after engine crank.
- No Sensor Supply DTCs set.
- No Under/Over voltage DTCs set.
- Battery voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- Transfer Case Range Position Signal circuit voltage is more than 4.15 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING:
 - **DHF/DHP** : Lock the clutch if last known position was in 4WD. If failed in 2WD, maintain clutch open position.
 - **DHN/DHW** : No action.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR:
 - **DHF/DHP** : Maintain last engage/disengage position.
 - **DHN/DHW** : Engage when condition is safe (zero vehicle speed).
- FRONT AXLE LOCKER ACTUATOR: Maintain position if locked, allow customer selected disengagement. Don't allow re-lock
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
MODE SELECT CIRCUIT OPEN OR HIGH RESISTANCE
RANGE POSITION SENSOR (RPS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (K977) MODE SELECT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK THE RANGE POSITION SENSOR (RPS)

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1124.2Ω	1183.4Ω	1242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

1. Disconnect the RPS harness connector.
2. Measure the resistance across the Signal and Ground terminals at the sensor while moving the Transfer Case Shifter to all four positions. Note the resistance reading for each position.

Is the resistance within specification for each position?

Yes

- Go To [6](#)

No

- Replace the RPS in accordance with the Service Information. Refer to the appropriate service information .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1403-92-TRANSFER CASE RANGE POSITION SENSOR-PERFORMANCE OR INCORRECT OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Range Position Sensor (RPS) is a serviceable component located on the top center of the Transfer Case next to the vent tube. There are two circuits between the sensor and the (DTCM) Drivetrain Control Module:

- Signal
- Sensor Ground

The RPS is a five-position, resistive type sensor. The sensor contains a plunger that contacts the sector plate inside the Transfer Case which has four discrete positions. The plunger moves in and out of the sensor body as the Transfer Case is shifted. As the plunger is depressed, the resistance value changes.

The sensor ground is used as a low voltage reference. The signal circuit feeds an analog input to the Drivetrain Control Module (DTCM) using a pull-up resistor to 5 volts. The resulting voltage value for each position is read by the DTCM to determine the Transfer Case range position. The voltage is also used by the DTCM software for diagnostic purposes.

TRANSFER CASE RANGE POSITION VS SIGNAL VOLTAGE

Range Position	Minimum voltage	Nominal Voltage	Maximum Voltage
2WD	3.336	3.517	3.682
4WD HIGH/4WD-AUTO	2.713	2.893	3.061
Neutral	1.356	1.491	1.633
4WD LOW	0.482	0.556	0.654

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1, 124.2Ω	1, 183.4Ω	1, 242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for longer than 1 second.
- No Controller Area Network (CAN) Bus DTCs.

- Vehicle speed is more than a calibrated limit.
- Vehicle is steady-state condition.

SET CONDITION

NOTE: An improper shift from 4WD HIGH to 4WD LOW can cause this DTC to set in some 2018 model year vehicles. If the condition can not be duplicated by shifting the Transfer Case normally, erase the DTCs and do not make any repairs. Advise the customer on proper Transfer Case shifting in accordance with the Owners Manual.

NOTE: An incorrect Transfer Case or Axle ratio can also cause this DTC to set. If the Axles or Transfer Case was replaced, make sure the Body Control Module (BCM) was reprogrammed with the correct gear ratios. If the BCM was recently reprogrammed, make sure it was programmed correctly.

- Engine speed and wheel speed do not correspond to the Transfer Case Range Position Sensor value
- Voltage on the (T314) Transfer Case Range Position Signal is out of normal limits.
- Either condition above is present for more than 10 seconds.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING:
 - **DHF/DHP** : Lock the clutch if last known position was in 4WD. If failed in 2WD, maintain clutch open position.
 - **DHN/DHW** : No action.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR:
 - **DHF/DHP** : Maintain last engage/disengage position.
 - **DHN/DHW** : Engage when condition is safe (zero vehicle speed).
- FRONT AXLE LOCKER ACTUATOR: Maintain position if locked, allow customer selected disengagement. Don't allow re-lock
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE SHIFT CABLE OUT OF ADJUSTMENT
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
MODE SELECT CIRCUIT OPEN OR HIGH RESISTANCE
RANGE POSITION SENSOR (RPS)
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: An improper shift from 4WD HIGH to 4WD LOW can cause this DTC to set in some 2018 model year vehicles. If the condition can not be duplicated by shifting the Transfer Case normally, erase the DTCs and do not make any repairs. Advise the customer on proper Transfer Case shifting in accordance with the Owners Manual.

NOTE: An incorrect Transfer Case or Axle ratio can also cause this DTC to set. If the Axles or Transfer Case was replaced, make sure the Body Control Module (BCM) was reprogrammed with the correct gear ratios. If the BCM was recently reprogrammed, make sure it was programmed correctly.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK TRANSFER CASE SHIFT CABLE ADJUSTMENT

1. Check the Transfer Case Shift cable adjustment in accordance with the Service Information. Refer to [CABLE, SHIFT, REMOVAL AND INSTALLATION CABLE, SHIFT, REMOVAL AND INSTALLATION](#) .

Is the Shift cable adjusted properly?

Yes

- Go To [3](#)

No

- Adjust the Shift cable as needed. Refer to [CABLE, SHIFT, REMOVAL AND INSTALLATION CABLE, SHIFT, REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (K977) MODE SELECT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

8. CHECK THE RANGE POSITION SENSOR (RPS)

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1124.2Ω	1183.4Ω	1242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

1. Disconnect the RPS harness connector.
2. Measure the resistance across the Signal and Ground terminals at the sensor while moving the Transfer Case Shifter to all four positions. Note the resistance reading for each position.

Is the resistance within specification for each position?

Yes

- Go To [9](#)

No

- Replace the RPS in accordance with the Service Information. Refer to the appropriate service information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1406-11-TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after engine crank.
- No Under/Over voltage DTCs set.
- Battery voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- When Step Motor Control D circuit is commanded off and both of the following conditions are true:
 - Voltage on the Step Motor Control D circuit is less than 0.734
 - Voltage on the Switched Battery Solenoid Supply circuit is less than 1.95 volts.
- When Switched Battery Solenoid Supply circuit is commanded on:
 - Current monitored across the H-bridge driver is more than 6.42 amps.
- Either of the above conditions are present for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Maintain current position.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- AXLE LOCKERS: Normal Operation.

- T-CASE CLUTCH: Normal Operation.

POSSIBLE CAUSES

Possible Causes
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO GROUND
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Go To [3](#)

3. CHECK THE DRIVETRAIN CONTROL MODULE (DTCM) MOTOR BRAKE SOLENOID DRIVERS FOR PROPER OPERATION

1. Reconnect the DTCM C1 harness connector.
2. Turn the ignition on.
3. Connect a 12-volt test light across the (T301) Switched Battery Solenoid Supply circuit and the (T317) Step Motor Control D in the Transfer Case Shift Motor C1 harness connector.

NOTE: **This DTC disables the high side driver for this circuit. Erasing the DTCs will allow the DTCM to re-enable the high side driver so the following steps can be performed.**

4. With the scan tool, erase DTCs.
5. With the scan tool, actuate the T-Case Motor Solenoid Lock in the DTCM.

NOTE: **Compare the brightness to that of a direct connection to the battery.**

Does the test light illuminate brightly?

Yes

- Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1406-15-TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after cranking engine.
- No Under/Over voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- One or more of the following conditions are true:
 - The Drivetrain Control Module (DTCM) detects an open or short to voltage with the (T317) Step Motor Control D circuit commanded off.
 - The DTCM detects the current draw is below 6.42 amps with the (T317) Step Motor Control D circuit commanded on.

DEFAULT ACTION

- Shift Motor brake will be disabled while the fault is present.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.

- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
STEP MOTOR CONTROL D CIRCUIT OPEN OR HIGH RESISTANCE
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
STEP MOTOR CONTROL D CIRCUIT SHORTED TO ANOTHER CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T317) STEP MOTOR CONTROL D CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (T317) STEP MOTOR CONTROL D CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#).

No

- Go To [6](#)

6. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, REMOVAL AND INSTALLATION**](#).
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [**MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

C1406-92-TRANSFER CASE BRAKE CONTROL-PERFORMANCE OR INCORRECT OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- Shift Motor Brake is requested to be engaged.
- No Controller Area Network (CAN) Bus DTCs.

SET CONDITION

- Drivetrain Control Module (DTCM) is detecting pulses from the Shift Motor internal Mode Sensors when the motor brake is commanded to be engaged.
- The above condition occurs 8 times during an ignition cycle.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Normal Functionality but use motor holding current to achieve and maintain desired position, assuming no motor over-temp.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE SHIFT MOTOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE DRIVETRAIN CONTROL MODULE (DTCM) MOTOR BRAKE SOLENOID DRIVERS FOR PROPER OPERATION

1. Turn the ignition on.
2. Disconnect the Shift Motor harness connector.
3. Connect a 12-volt test light across the (T301) Switched Battery Solenoid Supply circuit and the (T317) Step Motor Control D at the Transfer Case Shift Motor C1 harness connector.

NOTE: This DTC disables the high side driver for this circuit. Erasing the DTCs will allow the DTCM to re-enable the high side driver so the following steps can be performed.

4. With the scan tool, erase the DTCs.
5. With the scan tool, actuate the T-Case Motor Solenoid Lock in the DTCM.

NOTE: Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#).
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM Module DTCs.

Did the DTC return?

Yes

- Replace the DTCM Module in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Repair the poor connections as necessary.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C140A-11-TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Shift Motor Control circuit voltage is less than 2.9 volts for more than 3.0 seconds when 4WD mode is not active.
- Shift Motor Control circuit current is greater than 85.713 amps for more than 3.0 seconds when 4WD mode is active (30A fuse will be blown).

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO GROUND
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO GROUND
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C140A-12-TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO BATTERY

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Motor Control circuit voltage is more than 4.5 volts for more than 3.0 seconds when 4WD mode is not active.
- Motor Control circuit current is greater than 85.713 amps for more than 3.0 seconds when 4WD mode is active (30A fuse will be blown). (May not be detected if duty cycle is 100%.)

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO VOLTAGE
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
 3. With the scan tool, erase DTCs.
 4. Turn the ignition off for at least 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST STANDARD PROCEDURE**](#) .

No

- Go To [**3**](#)

3. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, REMOVAL AND INSTALLATION**](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C140A-13-TRANSFER CASE MOTOR CONTROL-CIRCUIT OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Both of the following conditions are true for more than 3 seconds:
 - Voltage on Shift Motor Control A circuit is less than 2.9 volts.
 - Voltage on Shift Motor Control B circuit is above 4.5 volts

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.

- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SHIFT MOTOR CONTROL A CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL B CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C140A-4B-TRANSFER CASE MOTOR CONTROL-OVER TEMPERATURE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Thermistor located on the Drivetrain Control Module near the H-bridge for the Motor Control circuits indicates an over-temperature condition.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
MOTOR CONTROL CIRCUIT DTCS ARE SET DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR RELATED DTCS

1. Refer to the recorded DTCs.

Are any Transfer Case Motor Control related DTCs set?

Yes

- Refer to the appropriate procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

NOTE: This DTC can be caused by overuse of the Transfer Case Motor. Ensure customer driving habits are not causing this DTC before continuing with this procedure.

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

4. REPLACE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION**.
2. With the scan tool, erase DTCs.
3. Turn the ignition off then back on.
4. Operate the vehicle within the conditions that originally set this DTC or use the When Monitored Conditions as a guide.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service Information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C140E-00-TRANSFER CASE MOTOR BLOCKED

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Controller Area Network (CAN) Bus DTCs.
- Incremental sensor data valid.

SET CONDITION

- Transfer Case Motor speed is less than 1 rpm when motor current is above 15 amps for more than 30 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE INTERNAL CONDITION
TRANSFER CASE SHIFT MOTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE TRANSFER CASE FOR MECHANICAL ISSUES

1. Turn the ignition off.
2. Inspect the Transfer Case in accordance with the Service Information to determine if there are any mechanical conditions that are preventing the Shift Motor from engaging the requested range. Remove the Transfer Case Shift Motor and inspect the shift mechanism to determine if a mechanical condition exists with the Transfer Case.

Were any mechanical issues found?

Yes

- Repair or replace the Transfer Case in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE TRANSFER CASE SHIFT MOTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Using the wiring diagram/schematic as a guide, inspect all wiring and connectors that pertain to this circuit.
3. If any problems are found, repair as necessary and retest.

4. If no problems were found, replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
5. With the scan tool, erase the DTCs.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Transfer Case in accordance with the Service information. Refer to **REMOVAL AND INSTALLATION REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Repairing the wiring condition or replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1412-11-TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Selector (4WD-AUTO) Switch is not a serviceable component of the Transfer Case Shifter assembly. There are 2 circuits between the Transfer Case Selector Switch and the DTCM:

- 4WD-Auto Request Signal
- Ground

When the Transfer Case shifter is put into the 4WD-AUTO position, the Transfer Case Selector Switch located on the Transfer Case Shifter assembly completes a circuit to ground through the 4WD-Auto Request Signal circuit. The DTCM then monitors the ABS Wheel Speeds that are received over the CAN. When wheel slippage is detected, the DTCM modulates the front drive clutch to send torque to the front axle as needed.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Under/Over voltage DTCs are set.

SET CONDITION

- Transfer Case Position Sensor Input circuit voltage is below 0.25 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: If (T314) Transfer Case Range Position Signal indicates 4WD HIGH, that position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.

- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORTED TO GROUND
TRANSFER CASE SELECTOR SWITCH
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (K77) TRANSFER CASE POSITION SENSOR INPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE TRANSFER CASE SELECTOR SWITCH AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Selector Switch in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Transfer Case Selector Switch corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1412-15-TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Selector (4WD-AUTO) Switch is not a serviceable component of the Transfer Case Shifter assembly. There are 2 circuits between the Transfer Case Selector Switch and the DTCM:

- 4WD-Auto Request Signal
- Ground

When the Transfer Case shifter is put into the 4WD-AUTO position, the Transfer Case Selector Switch located on the Transfer Case Shifter assembly completes a circuit to ground through the 4WD-Auto Request Signal circuit. The DTCM then monitors the ABS Wheel Speeds that are received over the CAN. When wheel slippage is detected, the DTCM modulates the front drive clutch to send torque to the front axle as needed.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Under/Over voltage DTCs are set.

SET CONDITION

- Transfer Case Position Sensor Input circuit voltage is above a calibrated value for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: If (T314) Transfer Case Range Position Signal indicates 4WD HIGH, that position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SELECTOR SWITCH
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (K77) TRANSFER CASE POSITION SENSOR INPUT CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (K77) TRANSFER CASE POSITION SENSOR INPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. REPLACE THE TRANSFER CASE SELECTOR SWITCH AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Selector Switch in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Selector Switch corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1415-92-TRANSFER CASE MOTOR CURRENT-PERFORMANCE OR INCORRECT OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on or 1 second after engine crank.
- No Sensor supply circuit DTCs.
- Battery voltage between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- Current on one of the Motor Control circuits is more than 25 amps when the Shift Motor is active.
- Current on one of the Motor Control circuits is more than 250 mA when the Shift Motor is not active.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained unless an over temperature condition is detected.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL A CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO GROUND
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO VOLTAGE
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO ANOTHER CIRCUIT
SHIFT MOTOR CONTROL B CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO GROUND
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO VOLTAGE
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO ANOTHER CIRCUIT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

8. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [11](#)

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1416-11-FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Front Axle Locker Actuator is in OFF state (disengaged).

SET CONDITION

- Front Locker Return circuit voltage below 1.47 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Maintain current state. Allow customer disengagement. No reengage allowed.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER RETURN CIRCUIT SHORTED TO GROUND FRONT AXLE LOCKER ACTUATOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T524) FRONT LOCKER RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [4](#)

4. REPLACE THE FRONT AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Actuator in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION**.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Front Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1416-12-FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Front Axle Locker Actuator is in ON state (engaged).

SET CONDITION

- The low-side driver Field-Effect Transistor (FET) (T524) Front Locker Return circuit could be shorted to voltage.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Maintain current state. Allow customer disengagement. No reengage allowed.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER RETURN CIRCUIT SHORTED TO VOLTAGE
FRONT AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T524) FRONT LOCKER RETURN CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE FRONT AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Front Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1416-13-FRONT DIFFERENTIAL CONTROL-CIRCUIT OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Front Axle Locker Actuator is in OFF state (disengaged).

SET CONDITION

- Front Locker Return circuit voltage is between 1.47 and 6.37 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Maintain current state. Allow customer disengagement. No reengage allowed.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER RETURN CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION RUN/START CONTROL OUTPUT
FRONT AXLE LOCKER ACTUATOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (F946) FUSED IGNITION CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

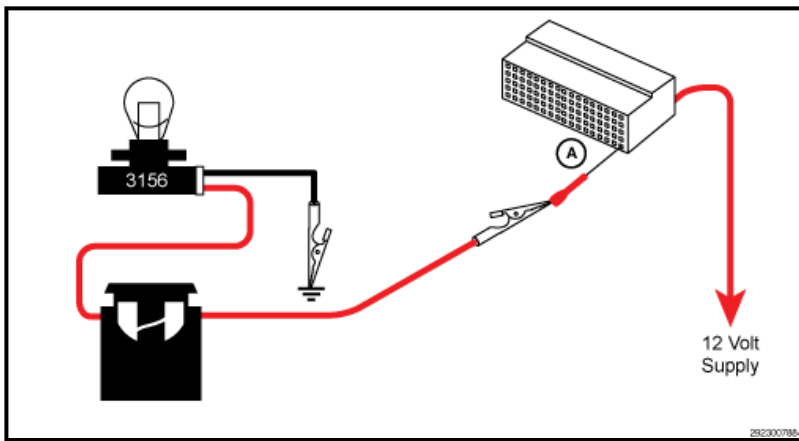
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to the appropriate service information .

3. ISOLATE AND CHECK THE (T524) FRONT LOCKER RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [5](#)

5. REPLACE THE FRONT AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Actuator in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Front Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C141C-11-REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Rear Locker is in OFF state (disengaged).

SET CONDITION

- Rear Locker Return circuit voltage is less than 1.47 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Front Axle will be disengaged if locked.
- REAR AXLE LOCKER ACTUATOR: Maintain current state.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER RETURN CIRCUIT SHORTED TO GROUND
REAR AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T528) REAR LOCKER RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brining on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Actuator in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To

No

- Replacing the Rear Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C141C-12-REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Rear Locker is in ON state (engaged).

SET CONDITION

- The low-side driver Field-Effect Transistor Rear Locker Return circuit could be shorted to voltage.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.

- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Front Axle will be disengaged if locked.
- REAR AXLE LOCKER ACTUATOR: Maintain current state.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER RETURN CIRCUIT SHORTED TO VOLTAGE
REAR AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T528) REAR LOCKER RETURN CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Actuator in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Rear Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C141C-13-REAR DIFFERENTIAL CONTROL-CIRCUIT OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Rear Locker is in OFF state (disengaged).

SET CONDITION

- Rear Locker Return circuit voltage is between 1.47 and 6.37 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Front Axle will be disengaged if locked.
- REAR AXLE LOCKER ACTUATOR: Maintain current state.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER RETURN CIRCUIT OPEN OR HIGH RESISTANCE
REAR AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (F946) FUSED IGNITION CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE:

Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load

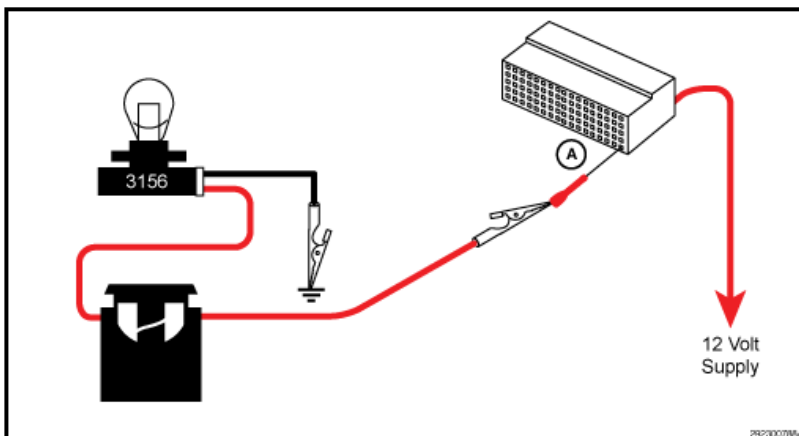
testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to the appropriate service information .

3. ISOLATE AND CHECK THE (T528) REAR LOCKER RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Actuator in accordance with the Service Information. Refer to [REMOVAL AND INSTALLATION](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.

5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Rear Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1438-00-TRANSFER CASE DIFFERENTIAL CLUTCH WORN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Over-travel DTCs.
- No Encoder Signal circuit DTCs.

SET CONDITION

- The Drivetrain Control Module (DTCM) has detected that the clutch has traveled beyond safe limits during normal operation or when a kiss-point learn routine has been performed.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
DRIVETRAIN SENSOR RETURN CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE CLUTCH WORN
DTCM

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (K594) DRIVETRAIN SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK FOR A WORN TRANSFER CASE CLUTCH

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. Shift the Transfer case into 2WD.
4. With the scan tool, perform the "Non-Volatile Memory Reset (Clear T-Case Adaptives)" routine.
5. Turn the ignition off for 10 seconds, then turn ignition on. (Do not perform any Transfer Case shifts.)

NOTE: When the ignition is turned back on, the Drivetrain Control Module (DTCM) will perform a Clutch Learn.

6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the worn clutch pack assembly in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1444-00-T-CASE MOTOR OVERUSE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Controller Area Network (CAN) Bus DTCs.

SET CONDITION

- A thermal model is used to determine motor temperature. If the predicted motor temperature is more than a safe value, this DTC sets.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch will be locked, if possible.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Engaged.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
AMBIENT AIR TEMPERATURE (AAT) SENSOR
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Extreme vehicle maneuvers can cause this DTC to set if the motor lock is constantly being engaged and disengaged making the shift motor work harder to keep the clutch engaged.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

NOTE: Diagnose and repair any system voltage or Transfer Case related DTCs in the Drivetrain Control Module (DTCM) before continuing with this test.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK AMBIENT AIR TEMPERATURE SENSOR VALUE

1. With the scan tool, read the Ambient Air Temperature Sensor value in the Body Control Module (BCM) data list.

Is the ambient air temperature value accurate?

Yes

- Go To [3](#)

No

- Check the Ambient Air Temperature sensor circuits for an open, high resistance, and shorts. If no problems are found, replace the Ambient Air Temperature Sensor in accordance with the Service Information.
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

3. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

NOTE: A Mechanical failure of the Motor Brake can cause the motor to constantly keep the clutch electronically engaged. Extreme vehicle maneuvers can also cause this DTC to set if the motor lock is constantly being engaged and disengaged making the shift motor work harder to keep the clutch engaged.

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C144D-11-FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Front Locker Switch Sense circuit is more than 22.3 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to Service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Front Axle will remain engaged if locked. Customer is allowed to disengage however, locker can not be re-engaged.
- Rear Axle Locker Actuator: Maintain current state.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER SWITCH SENSE CIRCUIT SHORTED TO GROUND FRONT AXLE LOCKER SENSOR DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK THE (T522) FRONT LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.

4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [4](#)

4. REPLACE THE FRONT AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Front Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C144D-15-FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Front Locker Switch Sense circuit is less than 4.1 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.
- Rear Axle Locker Actuator: Maintain current state.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
FRONT LOCKER SWITCH SENSE CIRCUIT OPEN/HIGH RESISTANCE
FRONT LOCKER SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
FRONT AXLE LOCKER SENSOR DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T522) FRONT LOCKER SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow

the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T522) FRONT LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T523) FRONT LOCKER SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

6. REPLACE THE FRONT AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the Front Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C144D-64-FRONT DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Vehicle speed is more than 1 mph.
- Engine speed is more than 700 rpm for more than 1 second.
- Rear axle locker is not engaged.
- No Electronic Control Unit (ECU) memory or Controller Area Network (CAN) DTCs set.

SET CONDITION

- There is a mismatch between the commanded state and actual state of the front axle locker.

DEFAULT ACTION

- This monitor stops running once this DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.
- Rear Axle Locker Actuator: Normal operation.

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Diagnose all Front Axle Locker circuit related DTCs before continuing.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE FRONT AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Sensor in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .

2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Front Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1451-11-REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Rear Locker Switch Sense circuit is more than 22.3 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Limited Operation.
- Rear Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER SWITCH SENSE CIRCUIT SHORTED TO GROUND
REAR AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (T527) REAR LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Rear Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1451-15-REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Rear Locker Switch Sense circuit is less than 4.1 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Limited operation.
- Rear Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER SWITCH SENSE CIRCUIT OPEN OR HIGH RESISTANCE
REAR LOCKER SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
REAR LOCKER SENSOR RETURN CIRCUIT OPEN OR HIGH RESISTANCE
REAR LOCKER SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE
REAR AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T527) REAR LOCKER SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

3. ISOLATE AND CHECK THE (T527) REAR LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (T538) REAR LOCKER SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [6](#)

6. REPLACE THE REAR AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the Rear Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1451-64-REAR DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Vehicle speed is more than 1 mph.
- Engine speed is more than 700 rpm for more than 1 second.
- Rear axle locker is not engaged.
- No Electronic Control Unit (ECU) memory or Controller Area Network (CAN) DTCs set.

SET CONDITION

- There is a mismatch between the commanded state and actual state of the Rear Axle Locker.

DEFAULT ACTION

- This monitor stops running once this DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Disengage Front Locker if engaged.
- Rear Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.

POSSIBLE CAUSES

Possible Causes
REAR AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: **Diagnose all Rear Axle Locker circuit related DTCs before continuing.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE REAR AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.

5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Rear Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1463-11-FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Voltage on the (G304) Front Axle Lock Control circuit is below 2.8 volts for more than 1 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current position will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK CONTROL CIRCUIT SHORTED TO GROUND
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, Locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE (G304) FRONT AXLE LOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C1463-12-FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Current on the (G304) Front Axle Lock Control circuit is above 200 mA for more than 4 ms when this control driver is enabled and a current limiting feature is enabled.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current position will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK CONTROL CIRCUIT SHORTED TO VOLTAGE
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, Locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE (G304) FRONT AXLE LOCK CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1463-13-FRONT AXLE DISCONNECT CONTROL-CIRCUIT OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Voltage on the (G304) Front Axle Lock Control circuit is between 2.8 and 5.0 volts for 1 ms while this control driver is commanded off.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.

- T-CASE SHIFTING: Clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current position will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, Locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Dose the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (G304) FRONT AXLE LOCK CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK THE (F946) FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

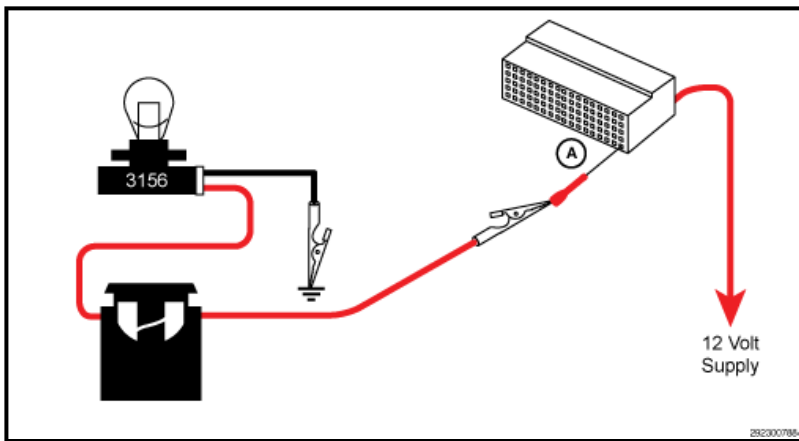
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Check the applicable fuse. If the fuse is open, repair the short to ground in the (F946) Fused Ignition Run/Start Control Output circuit.
- Perform the HVAC VERIFICATION TEST. Refer to [HVAC VERIFICATION TEST](#).

6. CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT RUN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the Front Axle Disconnect (FAD) Actuator harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the FAD Actuator harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM Module DTCs.

Did the DTC return?

Yes

- Replace the DTCM Module in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Repair the poor connections as necessary.
 - Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .
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Drivetrain Control Module (DTCM) - DTCS C1403-11 To C1463-13 - Gladiator

DTC TROUBLESHOOTING

C1403-11-TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Transfer Case Range Position Sensor (RPS) is a serviceable component located on the top center of the Transfer Case next to the vent tube. There are two circuits between the sensor and the (DTCM) Drivetrain Control Module:

- Signal
- Sensor Ground

The RPS is a five-position, resistive type sensor. The sensor contains a plunger that contacts the sector plate inside the Transfer Case which has four discrete positions. The plunger moves in and out of the sensor body as the Transfer Case is shifted. As the plunger is depressed, the resistance value changes.

The sensor ground is used as a low voltage reference. The signal circuit feeds an analog input to the Drivetrain Control Module (DTCM) using a pull-up resistor to 5 volts. The resulting voltage value for each position is read by the DTCM to determine the Transfer Case range position. The voltage is also used by the DTCM software for diagnostic purposes.

TRANSFER CASE RANGE POSITION VS SIGNAL VOLTAGE

Range Position	Minimum voltage	Nominal Voltage	Maximum Voltage
2WD	3.336	3.517	3.682
4WD HIGH/4WD-AUTO	2.713	2.893	3.061
Neutral	1.356	1.491	1.633
4WD LOW	0.482	0.556	0.654

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1, 124.2Ω	1, 183.4Ω	1, 242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after engine crank.
- No Sensor Supply DTCs set.
- No Under/Over voltage DTCs set.
- Battery voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- Transfer Case Range Position Signal circuit voltage is below 0.305 volt for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING:
 - **DHF/DHP** : Lock the clutch if last known position is in 4WD. If failed in 2WD, maintain clutch open position.
 - **DHN/DHW** : No action.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR:
 - **DHF/DHP** : Maintain last engage/disengage position.
 - **DHN/DHW** : Engage when condition is safe (zero vehicle speed).
- FRONT AXLE LOCKER ACTUATOR: Maintain position if locked, allow customer selected disengagement. Don't allow re-lock
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
RANGE POSITION SENSOR (RPS)
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to

follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE RANGE POSITION SENSOR (RPS)

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1124.2Ω	1183.4Ω	1242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

1. Disconnect the RPS harness connector.
2. Measure the resistance across the Signal and Ground terminals at the sensor while moving the Transfer Case Shifter to all four positions. Note the resistance reading for each position.

Is the resistance within specification for each position?

Yes

- Go To [4](#)

No

- Replace the RPS in accordance with the Service Information. Refer to the appropriate service information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1403-15-TRANSFER CASE RANGE POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Range Position Sensor (RPS) is a serviceable component located on the top center of the Transfer Case next to the vent tube. There are two circuits between the sensor and the (DTCM) Drivetrain Control Module:

- Signal
- Sensor Ground

The RPS is a five-position, resistive type sensor. The sensor contains a plunger that contacts the sector plate inside the Transfer Case which has four discrete positions. The plunger moves in and out of the sensor body as the Transfer Case is shifted. As the plunger is depressed, the resistance value changes.

The sensor ground is used as a low voltage reference. The signal circuit feeds an analog input to the Drivetrain Control Module (DTCM) using a pull-up resistor to 5 volts. The resulting voltage value for each position is read by the DTCM to determine the Transfer Case range position. The voltage is also used by the DTCM software for diagnostic purposes.

TRANSFER CASE RANGE POSITION VS SIGNAL VOLTAGE

Range Position	Minimum voltage	Nominal Voltage	Maximum Voltage
2WD	3.336	3.517	3.682
4WD HIGH/4WD-AUTO	2.713	2.893	3.061
Neutral	1.356	1.491	1.633
4WD LOW	0.482	0.556	0.654

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1, 124.2Ω	1, 183.4Ω	1, 242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after engine crank.
- No Sensor Supply DTCs set.
- No Under/Over voltage DTCs set.
- Battery voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- Transfer Case Range Position Signal circuit voltage is more than 4.15 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING:
 - **DHF/DHP** : Lock the clutch if last known position was in 4WD. If failed in 2WD, maintain clutch open position.
 - **DHN/DHW** : No action.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR:
 - **DHF/DHP** : Maintain last engage/disengage position.
 - **DHN/DHW** : Engage when condition is safe (zero vehicle speed).
- FRONT AXLE LOCKER ACTUATOR: Maintain position if locked, allow customer selected disengagement. Don't allow re-lock
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
MODE SELECT CIRCUIT OPEN OR HIGH RESISTANCE
RANGE POSITION SENSOR (RPS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (K977) MODE SELECT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK THE RANGE POSITION SENSOR (RPS)

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1124.2Ω	1183.4Ω	1242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

1. Disconnect the RPS harness connector.
2. Measure the resistance across the Signal and Ground terminals at the sensor while moving the Transfer Case Shifter to all four positions. Note the resistance reading for each position.

Is the resistance within specification for each position?

Yes

- Go To [6](#)

No

- Replace the RPS in accordance with the Service Information. Refer to the appropriate service information .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1403-92-TRANSFER CASE RANGE POSITION SENSOR-PERFORMANCE OR INCORRECT OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Range Position Sensor (RPS) is a serviceable component located on the top center of the Transfer Case next to the vent tube. There are two circuits between the sensor and the (DTCM) Drivetrain Control Module:

- Signal
- Sensor Ground

The RPS is a five-position, resistive type sensor. The sensor contains a plunger that contacts the sector plate inside the Transfer Case which has four discrete positions. The plunger moves in and out of the sensor body as the Transfer Case is shifted. As the plunger is depressed, the resistance value changes.

The sensor ground is used as a low voltage reference. The signal circuit feeds an analog input to the Drivetrain Control Module (DTCM) using a pull-up resistor to 5 volts. The resulting voltage value for each position is read by the DTCM to determine the Transfer Case range position. The voltage is also used by the DTCM software for diagnostic purposes.

TRANSFER CASE RANGE POSITION VS SIGNAL VOLTAGE

Range Position	Minimum voltage	Nominal Voltage	Maximum Voltage
2WD	3.336	3.517	3.682
4WD HIGH/4WD-AUTO	2.713	2.893	3.061
Neutral	1.356	1.491	1.633
4WD LOW	0.482	0.556	0.654

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1, 124.2Ω	1, 183.4Ω	1, 242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for longer than 1 second.
- No Controller Area Network (CAN) Bus DTCs.

- Vehicle speed is more than a calibrated limit.
- Vehicle is steady-state condition.

SET CONDITION

NOTE: An improper shift from 4WD HIGH to 4WD LOW can cause this DTC to set in some 2018 model year vehicles. If the condition can not be duplicated by shifting the Transfer Case normally, erase the DTCs and do not make any repairs. Advise the customer on proper Transfer Case shifting in accordance with the Owners Manual.

NOTE: An incorrect Transfer Case or Axle ratio can also cause this DTC to set. If the Axles or Transfer Case was replaced, make sure the Body Control Module (BCM) was reprogrammed with the correct gear ratios. If the BCM was recently reprogrammed, make sure it was programmed correctly.

- Engine speed and wheel speed do not correspond to the Transfer Case Range Position Sensor value
- Voltage on the (T314) Transfer Case Range Position Signal is out of normal limits.
- Either condition above is present for more than 10 seconds.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING:
 - **DHF/DHP** : Lock the clutch if last known position was in 4WD. If failed in 2WD, maintain clutch open position.
 - **DHN/DHW** : No action.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR:
 - **DHF/DHP** : Maintain last engage/disengage position.
 - **DHN/DHW** : Engage when condition is safe (zero vehicle speed).
- FRONT AXLE LOCKER ACTUATOR: Maintain position if locked, allow customer selected disengagement. Don't allow re-lock
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE SHIFT CABLE OUT OF ADJUSTMENT
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
MODE SELECT CIRCUIT OPEN OR HIGH RESISTANCE
RANGE POSITION SENSOR (RPS)
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: An improper shift from 4WD HIGH to 4WD LOW can cause this DTC to set in some 2018 model year vehicles. If the condition can not be duplicated by shifting the Transfer Case normally, erase the DTCs and do not make any repairs. Advise the customer on proper Transfer Case shifting in accordance with the Owners Manual.

NOTE: An incorrect Transfer Case or Axle ratio can also cause this DTC to set. If the Axles or Transfer Case was replaced, make sure the Body Control Module (BCM) was reprogrammed with the correct gear ratios. If the BCM was recently reprogrammed, make sure it was programmed correctly.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK TRANSFER CASE SHIFT CABLE ADJUSTMENT

1. Check the Transfer Case Shift cable adjustment in accordance with the Service Information. Refer to [CABLE, SHIFT, REMOVAL AND INSTALLATION CABLE, SHIFT, REMOVAL AND INSTALLATION](#) .

Is the Shift cable adjusted properly?

Yes

- Go To [3](#)

No

- Adjust the Shift cable as needed. Refer to [CABLE, SHIFT, REMOVAL AND INSTALLATION CABLE, SHIFT, REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T314) TRANSFER CASE RANGE POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (K977) MODE SELECT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

8. CHECK THE RANGE POSITION SENSOR (RPS)

TRANSFER CASE RANGE POSITION VS SENSOR RESISTANCE

Range Position	Minimum Resistance	Nominal Resistance	Maximum Resistance
2WD	1124.2Ω	1183.4Ω	1242.6Ω
4WD HIGH/4WD-AUTO	650.18Ω	684.4Ω	718.6Ω
Neutral	199.9Ω	210.4Ω	220.9Ω
4WD LOW	57.4Ω	60.4Ω	63.4Ω

1. Disconnect the RPS harness connector.
2. Measure the resistance across the Signal and Ground terminals at the sensor while moving the Transfer Case Shifter to all four positions. Note the resistance reading for each position.

Is the resistance within specification for each position?

Yes

- Go To [9](#)

No

- Replace the RPS in accordance with the Service Information. Refer to the appropriate service information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1406-11-TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after engine crank.
- No Under/Over voltage DTCs set.
- Battery voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- When Step Motor Control D circuit is commanded off and both of the following conditions are true:
 - Voltage on the Step Motor Control D circuit is less than 0.734
 - Voltage on the Switched Battery Solenoid Supply circuit is less than 1.95 volts.
- When Switched Battery Solenoid Supply circuit is commanded on:
 - Current monitored across the H-bridge driver is more than 6.42 amps.
- Either of the above conditions are present for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Maintain current position.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- AXLE LOCKERS: Normal Operation.

- T-CASE CLUTCH: Normal Operation.

POSSIBLE CAUSES

Possible Causes
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO GROUND
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Go To **3**

3. CHECK THE DRIVETRAIN CONTROL MODULE (DTCM) MOTOR BRAKE SOLENOID DRIVERS FOR PROPER OPERATION

1. Reconnect the DTCM C1 harness connector.
2. Turn the ignition on.
3. Connect a 12-volt test light across the (T301) Switched Battery Solenoid Supply circuit and the (T317) Step Motor Control D in the Transfer Case Shift Motor C1 harness connector.

NOTE: **This DTC disables the high side driver for this circuit. Erasing the DTCs will allow the DTCM to re-enable the high side driver so the following steps can be performed.**

4. With the scan tool, erase DTCs.
5. With the scan tool, actuate the T-Case Motor Solenoid Lock in the DTCM.

NOTE: **Compare the brightness to that of a direct connection to the battery.**

Does the test light illuminate brightly?

Yes

- Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Go To **4**

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1406-15-TRANSFER CASE BRAKE CONTROL-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second after cranking engine.
- No Under/Over voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for more than 500 ms.

SET CONDITION

- One or more of the following conditions are true:
 - The Drivetrain Control Module (DTCM) detects an open or short to voltage with the (T317) Step Motor Control D circuit commanded off.
 - The DTCM detects the current draw is below 6.42 amps with the (T317) Step Motor Control D circuit commanded on.

DEFAULT ACTION

- Shift Motor brake will be disabled while the fault is present.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.

- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
STEP MOTOR CONTROL D CIRCUIT OPEN OR HIGH RESISTANCE
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
STEP MOTOR CONTROL D CIRCUIT SHORTED TO ANOTHER CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T317) STEP MOTOR CONTROL D CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (T317) STEP MOTOR CONTROL D CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector

terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#).

No

- Go To [6](#)

6. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, REMOVAL AND INSTALLATION**](#).
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [**MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

C1406-92-TRANSFER CASE BRAKE CONTROL-PERFORMANCE OR INCORRECT OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- Shift Motor Brake is requested to be engaged.
- No Controller Area Network (CAN) Bus DTCs.

SET CONDITION

- Drivetrain Control Module (DTCM) is detecting pulses from the Shift Motor internal Mode Sensors when the motor brake is commanded to be engaged.
- The above condition occurs 8 times during an ignition cycle.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Normal Functionality but use motor holding current to achieve and maintain desired position, assuming no motor over-temp.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE SHIFT MOTOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE DRIVETRAIN CONTROL MODULE (DTCM) MOTOR BRAKE SOLENOID DRIVERS FOR PROPER OPERATION

1. Turn the ignition on.
2. Disconnect the Shift Motor harness connector.
3. Connect a 12-volt test light across the (T301) Switched Battery Solenoid Supply circuit and the (T317) Step Motor Control D at the Transfer Case Shift Motor C1 harness connector.

NOTE: This DTC disables the high side driver for this circuit. Erasing the DTCs will allow the DTCM to re-enable the high side driver so the following steps can be performed.

4. With the scan tool, erase the DTCs.
5. With the scan tool, actuate the T-Case Motor Solenoid Lock in the DTCM.

NOTE: Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes

- Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#).
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM Module DTCs.

Did the DTC return?

Yes

- Replace the DTCM Module in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Repair the poor connections as necessary.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C140A-11-TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Shift Motor Control circuit voltage is less than 2.9 volts for more than 3.0 seconds when 4WD mode is not active.
- Shift Motor Control circuit current is greater than 85.713 amps for more than 3.0 seconds when 4WD mode is active (30A fuse will be blown).

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO GROUND
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO GROUND
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C140A-12-TRANSFER CASE MOTOR CONTROL-CIRCUIT SHORT TO BATTERY

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Motor Control circuit voltage is more than 4.5 volts for more than 3.0 seconds when 4WD mode is not active.
- Motor Control circuit current is greater than 85.713 amps for more than 3.0 seconds when 4WD mode is active (30A fuse will be blown). (May not be detected if duty cycle is 100%.)

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO VOLTAGE
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST STANDARD PROCEDURE**](#) .

No

- Go To [**3**](#)

3. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, REMOVAL AND INSTALLATION**](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C140A-13-TRANSFER CASE MOTOR CONTROL-CIRCUIT OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Both of the following conditions are true for more than 3 seconds:
 - Voltage on Shift Motor Control A circuit is less than 2.9 volts.
 - Voltage on Shift Motor Control B circuit is above 4.5 volts

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.

- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SHIFT MOTOR CONTROL A CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL B CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C140A-4B-TRANSFER CASE MOTOR CONTROL-OVER TEMPERATURE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running more than 1 second.
- No Under/Over Voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Thermistor located on the Drivetrain Control Module near the H-bridge for the Motor Control circuits indicates an over-temperature condition.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
MOTOR CONTROL CIRCUIT DTCS ARE SET DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR RELATED DTCS

1. Refer to the recorded DTCs.

Are any Transfer Case Motor Control related DTCs set?

Yes

- Refer to the appropriate procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

NOTE: This DTC can be caused by overuse of the Transfer Case Motor. Ensure customer driving habits are not causing this DTC before continuing with this procedure.

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

4. REPLACE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
2. With the scan tool, erase DTCs.
3. Turn the ignition off then back on.
4. Operate the vehicle within the conditions that originally set this DTC or use the When Monitored Conditions as a guide.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service Information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C140E-00-TRANSFER CASE MOTOR BLOCKED

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Controller Area Network (CAN) Bus DTCs.
- Incremental sensor data valid.

SET CONDITION

- Transfer Case Motor speed is less than 1 rpm when motor current is above 15 amps for more than 30 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE INTERNAL CONDITION
TRANSFER CASE SHIFT MOTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE TRANSFER CASE FOR MECHANICAL ISSUES

1. Turn the ignition off.
2. Inspect the Transfer Case in accordance with the Service Information to determine if there are any mechanical conditions that are preventing the Shift Motor from engaging the requested range. Remove the Transfer Case Shift Motor and inspect the shift mechanism to determine if a mechanical condition exists with the Transfer Case.

Were any mechanical issues found?

Yes

- Repair or replace the Transfer Case in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE TRANSFER CASE SHIFT MOTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Using the wiring diagram/schematic as a guide, inspect all wiring and connectors that pertain to this circuit.
3. If any problems are found, repair as necessary and retest.

4. If no problems were found, replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
5. With the scan tool, erase the DTCs.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Transfer Case in accordance with the Service information. Refer to **REMOVAL AND INSTALLATION REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Repairing the wiring condition or replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1412-11-TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Selector (4WD-AUTO) Switch is not a serviceable component of the Transfer Case Shifter assembly. There are 2 circuits between the Transfer Case Selector Switch and the DTCM:

- 4WD-Auto Request Signal
- Ground

When the Transfer Case shifter is put into the 4WD-AUTO position, the Transfer Case Selector Switch located on the Transfer Case Shifter assembly completes a circuit to ground through the 4WD-Auto Request Signal circuit. The DTCM then monitors the ABS Wheel Speeds that are received over the CAN. When wheel slippage is detected, the DTCM modulates the front drive clutch to send torque to the front axle as needed.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Under/Over voltage DTCs are set.

SET CONDITION

- Transfer Case Position Sensor Input circuit voltage is below 0.25 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: If (T314) Transfer Case Range Position Signal indicates 4WD HIGH, that position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.

- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORTED TO GROUND
TRANSFER CASE SELECTOR SWITCH
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (K77) TRANSFER CASE POSITION SENSOR INPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE TRANSFER CASE SELECTOR SWITCH AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Selector Switch in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Transfer Case Selector Switch corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1412-15-TRANSFER CASE 4WD MODE SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Transfer Case Selector (4WD-AUTO) Switch is not a serviceable component of the Transfer Case Shifter assembly. There are 2 circuits between the Transfer Case Selector Switch and the DTCM:

- 4WD-Auto Request Signal
- Ground

When the Transfer Case shifter is put into the 4WD-AUTO position, the Transfer Case Selector Switch located on the Transfer Case Shifter assembly completes a circuit to ground through the 4WD-Auto Request Signal circuit. The DTCM then monitors the ABS Wheel Speeds that are received over the CAN. When wheel slippage is detected, the DTCM modulates the front drive clutch to send torque to the front axle as needed.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Under/Over voltage DTCs are set.

SET CONDITION

- Transfer Case Position Sensor Input circuit voltage is above a calibrated value for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: If (T314) Transfer Case Range Position Signal indicates 4WD HIGH, that position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SELECTOR SWITCH
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (K77) TRANSFER CASE POSITION SENSOR INPUT CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (K77) TRANSFER CASE POSITION SENSOR INPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. REPLACE THE TRANSFER CASE SELECTOR SWITCH AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Selector Switch in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Selector Switch corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1415-92-TRANSFER CASE MOTOR CURRENT-PERFORMANCE OR INCORRECT OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on or 1 second after engine crank.
- No Sensor supply circuit DTCs.
- Battery voltage between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- Current on one of the Motor Control circuits is more than 25 amps when the Shift Motor is active.
- Current on one of the Motor Control circuits is more than 250 mA when the Shift Motor is not active.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained unless an over temperature condition is detected.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL A CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO GROUND
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO VOLTAGE
SHIFT MOTOR CONTROL A CIRCUIT SHORTED TO ANOTHER CIRCUIT
SHIFT MOTOR CONTROL B CIRCUIT OPEN OR HIGH RESISTANCE
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO GROUND
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO VOLTAGE
SHIFT MOTOR CONTROL B CIRCUIT SHORTED TO ANOTHER CIRCUIT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T301) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T315) SHIFT MOTOR CONTROL A CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

8. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO VOLTAGE

1. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
2. Connect the negative lead of the DVOM to a known good ground.
3. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for voltage.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is voltage present on the circuit?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. ISOLATE AND CHECK THE (T316) SHIFT MOTOR CONTROL B CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [11](#)

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1416-11-FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Front Axle Locker Actuator is in OFF state (disengaged).

SET CONDITION

- Front Locker Return circuit voltage below 1.47 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Maintain current state. Allow customer disengagement. No reengage allowed.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER RETURN CIRCUIT SHORTED TO GROUND FRONT AXLE LOCKER ACTUATOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T524) FRONT LOCKER RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [4](#)

4. REPLACE THE FRONT AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Actuator in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION**.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Front Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1416-12-FRONT DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Front Axle Locker Actuator is in ON state (engaged).

SET CONDITION

- The low-side driver Field-Effect Transistor (FET) (T524) Front Locker Return circuit could be shorted to voltage.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Maintain current state. Allow customer disengagement. No reengage allowed.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER RETURN CIRCUIT SHORTED TO VOLTAGE
FRONT AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T524) FRONT LOCKER RETURN CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE FRONT AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Front Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1416-13-FRONT DIFFERENTIAL CONTROL-CIRCUIT OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Front Axle Locker Actuator is in OFF state (disengaged).

SET CONDITION

- Front Locker Return circuit voltage is between 1.47 and 6.37 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Maintain current state. Allow customer disengagement. No reengage allowed.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER RETURN CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION RUN/START CONTROL OUTPUT
FRONT AXLE LOCKER ACTUATOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE (F946) FUSED IGNITION CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

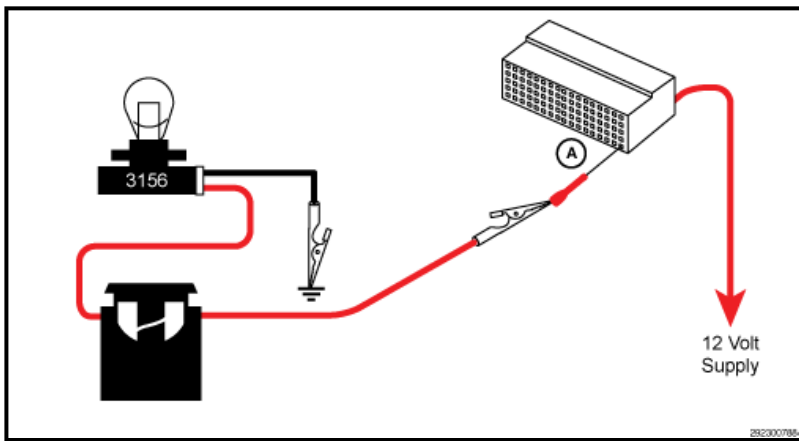
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to the appropriate service information .

3. ISOLATE AND CHECK THE (T524) FRONT LOCKER RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [5](#)

5. REPLACE THE FRONT AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Actuator in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Front Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C141C-11-REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Rear Locker is in OFF state (disengaged).

SET CONDITION

- Rear Locker Return circuit voltage is less than 1.47 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Front Axle will be disengaged if locked.
- REAR AXLE LOCKER ACTUATOR: Maintain current state.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER RETURN CIRCUIT SHORTED TO GROUND
REAR AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T528) REAR LOCKER RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Actuator in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To

No

- Replacing the Rear Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C141C-12-REAR DIFFERENTIAL CONTROL-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Rear Locker is in ON state (engaged).

SET CONDITION

- The low-side driver Field-Effect Transistor Rear Locker Return circuit could be shorted to voltage.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.

- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Front Axle will be disengaged if locked.
- REAR AXLE LOCKER ACTUATOR: Maintain current state.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER RETURN CIRCUIT SHORTED TO VOLTAGE
REAR AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T528) REAR LOCKER RETURN CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Actuator in accordance with the Service Information.
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Rear Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C141C-13-REAR DIFFERENTIAL CONTROL-CIRCUIT OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No system Under/Over voltage DTCs set.
- Rear Locker is in OFF state (disengaged).

SET CONDITION

- Rear Locker Return circuit voltage is between 1.47 and 6.37 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-CASE SHIFTING: Normal Operation.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Front Axle will be disengaged if locked.
- REAR AXLE LOCKER ACTUATOR: Maintain current state.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER RETURN CIRCUIT OPEN OR HIGH RESISTANCE
REAR AXLE LOCKER ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE (F946) FUSED IGNITION CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE:

Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load

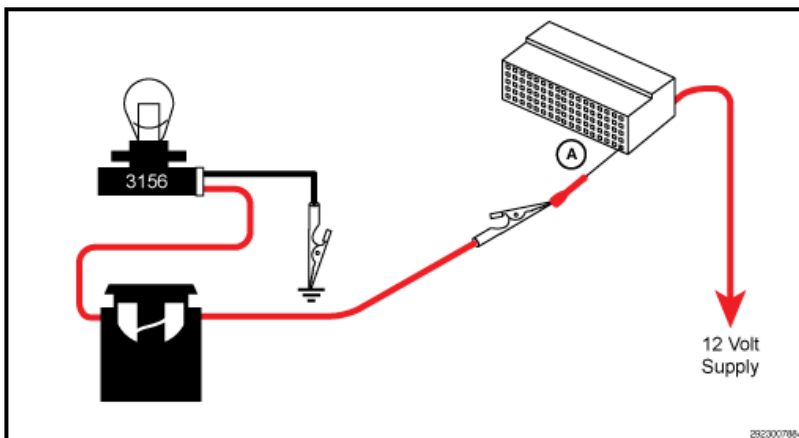
testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to the appropriate service information .

3. ISOLATE AND CHECK THE (T528) REAR LOCKER RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brining on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Actuator in accordance with the Service Information. Refer to [REMOVAL AND INSTALLATION](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.

5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Rear Axle Locker Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1438-00-TRANSFER CASE DIFFERENTIAL CLUTCH WORN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Over-travel DTCs.
- No Encoder Signal circuit DTCs.

SET CONDITION

- The Drivetrain Control Module (DTCM) has detected that the clutch has traveled beyond safe limits during normal operation or when a kiss-point learn routine has been performed.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
DRIVETRAIN SENSOR RETURN CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE CLUTCH WORN
DTCM

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (K594) DRIVETRAIN SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK FOR A WORN TRANSFER CASE CLUTCH

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. Shift the Transfer case into 2WD.
4. With the scan tool, perform the "Non-Volatile Memory Reset (Clear T-Case Adaptives)" routine.
5. Turn the ignition off for 10 seconds, then turn ignition on. (Do not perform any Transfer Case shifts.)

NOTE: When the ignition is turned back on, the Drivetrain Control Module (DTCM) will perform a Clutch Learn.

6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the worn clutch pack assembly in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1444-00-T-CASE MOTOR OVERUSE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Controller Area Network (CAN) Bus DTCs.

SET CONDITION

- A thermal model is used to determine motor temperature. If the predicted motor temperature is more than a safe value, this DTC sets.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch will be locked, if possible.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Engaged.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
AMBIENT AIR TEMPERATURE (AAT) SENSOR
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Extreme vehicle maneuvers can cause this DTC to set if the motor lock is constantly being engaged and disengaged making the shift motor work harder to keep the clutch engaged.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

NOTE: Diagnose and repair any system voltage or Transfer Case related DTCs in the Drivetrain Control Module (DTCM) before continuing with this test.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK AMBIENT AIR TEMPERATURE SENSOR VALUE

1. With the scan tool, read the Ambient Air Temperature Sensor value in the Body Control Module (BCM) data list.

Is the ambient air temperature value accurate?

Yes

- Go To [3](#)

No

- Check the Ambient Air Temperature sensor circuits for an open, high resistance, and shorts. If no problems are found, replace the Ambient Air Temperature Sensor in accordance with the Service Information.
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

3. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

NOTE: A Mechanical failure of the Motor Brake can cause the motor to constantly keep the clutch electronically engaged. Extreme vehicle maneuvers can also cause this DTC to set if the motor lock is constantly being engaged and disengaged making the shift motor work harder to keep the clutch engaged.

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION** .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C144D-11-FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Front Locker Switch Sense circuit is more than 22.3 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to Service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Front Axle will remain engaged if locked. Customer is allowed to disengage however, locker can not be re-engaged.
- Rear Axle Locker Actuator: Maintain current state.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER SWITCH SENSE CIRCUIT SHORTED TO GROUND FRONT AXLE LOCKER SENSOR DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK THE (T522) FRONT LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.

4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [4](#)

4. REPLACE THE FRONT AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Front Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C144D-15-FRONT DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Front Locker Switch Sense circuit is less than 4.1 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.
- Rear Axle Locker Actuator: Maintain current state.

POSSIBLE CAUSES

Possible Causes
FRONT LOCKER SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
FRONT LOCKER SWITCH SENSE CIRCUIT OPEN/HIGH RESISTANCE
FRONT LOCKER SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
FRONT AXLE LOCKER SENSOR DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Front Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the COMPONENT harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T522) FRONT LOCKER SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow

the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T522) FRONT LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T523) FRONT LOCKER SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

6. REPLACE THE FRONT AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the Front Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C144D-64-FRONT DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Vehicle speed is more than 1 mph.
- Engine speed is more than 700 rpm for more than 1 second.
- Rear axle locker is not engaged.
- No Electronic Control Unit (ECU) memory or Controller Area Network (CAN) DTCs set.

SET CONDITION

- There is a mismatch between the commanded state and actual state of the front axle locker.

DEFAULT ACTION

- This monitor stops running once this DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.
- Rear Axle Locker Actuator: Normal operation.

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Diagnose all Front Axle Locker circuit related DTCs before continuing.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE FRONT AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Front Axle Locker Sensor in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .

2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Front Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1451-11-REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Rear Locker Switch Sense circuit is more than 22.3 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Limited Operation.
- Rear Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER SWITCH SENSE CIRCUIT SHORTED TO GROUND
REAR AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (T527) REAR LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE REAR AXLE LOCKER ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Rear Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1451-15-REAR DIFFERENTIAL POSITION SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No Over/Under system voltage DTCs set.

SET CONDITION

- Current draw on the Rear Locker Switch Sense circuit is less than 4.1 mA for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Limited operation.
- Rear Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.

POSSIBLE CAUSES

Possible Causes
REAR LOCKER SWITCH SENSE CIRCUIT OPEN OR HIGH RESISTANCE
REAR LOCKER SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
REAR LOCKER SENSOR RETURN CIRCUIT OPEN OR HIGH RESISTANCE
REAR LOCKER SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE
REAR AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (T527) REAR LOCKER SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

3. ISOLATE AND CHECK THE (T527) REAR LOCKER SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (T538) REAR LOCKER SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#).

5. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [6](#)

6. REPLACE THE REAR AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the Rear Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1451-64-REAR DIFFERENTIAL POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Vehicle speed is more than 1 mph.
- Engine speed is more than 700 rpm for more than 1 second.
- Rear axle locker is not engaged.
- No Electronic Control Unit (ECU) memory or Controller Area Network (CAN) DTCs set.

SET CONDITION

- There is a mismatch between the commanded state and actual state of the Rear Axle Locker.

DEFAULT ACTION

- This monitor stops running once this DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service Axle Locker System will be displayed.
- T-Case Shifting: Normal Operation.
- Front Axle Disconnect (FAD) Actuator: Normal Operation.
- Front Axle Locker Actuator: Disengage Front Locker if engaged.
- Rear Axle Locker Actuator: Maintain current state. Allow customer disengagement. No reengage allowed.

POSSIBLE CAUSES

Possible Causes
REAR AXLE LOCKER SENSOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: **Diagnose all Rear Axle Locker circuit related DTCs before continuing.**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE DTCM HARNESS CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the DTCM harness connector for proper connection at the Rear Differential.
3. Verify that the connector is completely plugged in and locked prior to disconnecting.
4. Disconnect the DTCM harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the service information or properly connect and lock the DTCM harness connector.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE REAR AXLE LOCKER SENSOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Rear Axle Locker Sensor in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.

5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Rear Axle Locker Sensor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C1463-11-FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Voltage on the (G304) Front Axle Lock Control circuit is below 2.8 volts for more than 1 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current position will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK CONTROL CIRCUIT SHORTED TO GROUND
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, Locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE (G304) FRONT AXLE LOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C1463-12-FRONT AXLE DISCONNECT CONTROL-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Current on the (G304) Front Axle Lock Control circuit is above 200 mA for more than 4 ms when this control driver is enabled and a current limiting feature is enabled.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current position will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK CONTROL CIRCUIT SHORTED TO VOLTAGE
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, Locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE (G304) FRONT AXLE LOCK CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C1463-13-FRONT AXLE DISCONNECT CONTROL-CIRCUIT OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Voltage on the (G304) Front Axle Lock Control circuit is between 2.8 and 5.0 volts for 1 ms while this control driver is commanded off.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.

- T-CASE SHIFTING: Clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current position will be maintained.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, Locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Dose the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (G304) FRONT AXLE LOCK CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK THE (F946) FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

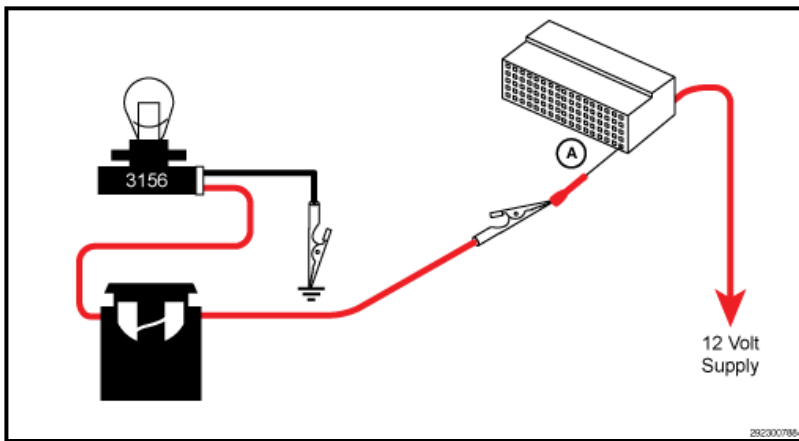
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#) .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Check the applicable fuse. If the fuse is open, repair the short to ground in the (F946) Fused Ignition Run/Start Control Output circuit.
- Perform the HVAC VERIFICATION TEST. Refer to [HVAC VERIFICATION TEST](#).

6. CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT RUN CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the Front Axle Disconnect (FAD) Actuator harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the FAD Actuator harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM Module DTCs.

Did the DTC return?

Yes

- Replace the DTCM Module in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Repair the poor connections as necessary.
 - Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .
-

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - DTCS C1477-4B To U0429-00 - Gladiator

DTC TROUBLESHOOTING

C1477-4B-TRANSFER CASE CLUTCH-OVER TEMPERATURE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Controller Area Network (CAN) Bus DTCs.

SET CONDITION

- Predicted transfer case clutch temperature is more than a safe value.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.

- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
EXTREME DRIVING CONDITIONS INTERNAL TRANSFER CASE FAILURE DRIVELINE FAILURE (PROPSHAFT, AXLE, OTHER) AMBIENT AIR TEMPERATURE (AAT) SENSOR PROBLEM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK AMBIENT AIR TEMPERATURE (AAT) SENSOR VALUE

1. With the scan tool, read the AAT Sensor value in the Body Control Module (BCM) data list.

Is the ambient air temperature value accurate?

Yes

- Go To [3](#)

No

- Check the AAT Sensor circuits for an open, high resistance, and shorts. If no problems are found, replace the AAT Sensor in accordance with the Service Information.
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

3. CHECK TRANSFER CASE FLUID LEVEL

1. Check the Transfer Case fluid level in accordance with the Service Information. Refer to the appropriate service information .

Is the fluid at the correct level?

Yes

- Go To [4](#)

No

- Check the Transfer Case for leaks and fill to the proper level.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK DRIVELINE COMPONENT OPERATION

1. Raise and support the vehicle with all four wheels off the ground. Refer to [HOISTING, STANDARD PROCEDURE](#) .
2. Start the engine, place the transfer case in 4WD HI and shift Transmission into DRIVE.

NOTE: All four wheels should be spinning at the same speed.

3. Shift the Transfer Case into 4WD LOW in accordance with the Owners Service Information

NOTE: All four wheels should be spinning at the same speed.

Do all four wheels spin at the same speed?

Yes

- Go To [5](#)

No

- Repair the affected driveline component in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. VERIFY DRIVING CONDITIONS

NOTE: Check with customer on driving terrain (e.g. mud, sand, snow) for set condition. Operating the vehicle in a manner that causes the clutch to engage/disengage too many times in a short time period will also cause this DTC to set.

1. With the scan tool, erase DTCs.
2. Allow the Transfer Case to cool down.
3. Test drive vehicle on dry paved road.
4. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Extreme driving conditions caused DTC to set.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. PERFORM A NON-VOLITILE MEMORY RESET AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. Shift the Transfer case into 2WD.
4. With the scan tool, perform the "Non-Volatile Memory Reset (Clear T-Case Adaptives)" routine.
5. Turn the ignition off for 10 seconds, then turn ignition on. (Do not perform any Transfer Case shifts.)

NOTE: When the ignition is turned back on, the Drivetrain Control Module (DTCM) will perform a Clutch Learn.

6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- The Reset and Clutch Learn has corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Repair or replace the Transfer Case as necessary in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C147B-12-FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Front Axle Lock Signal circuit voltage is more than 7.22 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. MEASURE VOLTAGE ON THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT WITH THE DTCM CONNECTED AND IGNITION ON

NOTE: **Leave the Front Axle Disconnect (FAD) Actuator harness connector disconnected.**

1. Connect the DTCM harness connector.
2. Turn the ignition on.
3. Measure voltage on the (G303) Front Axle Lock Signal circuit at the FAD harness connector.

Is the voltage above 7.22 volts?

Yes

- Go To [4](#)

No

- Replace the FAD Actuator in accordance with the Service Information. .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147B-14-FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO GROUND OR OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Front Axle Lock Signal circuit voltage is below 1.19 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.

- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
FRONT AXLE LOCK SIGNAL CIRCUIT SHORTED TO GROUND
FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT OPEN OR SHORTED TO GROUND
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED TO GROUND
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show **disengaged**.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE (F946) FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

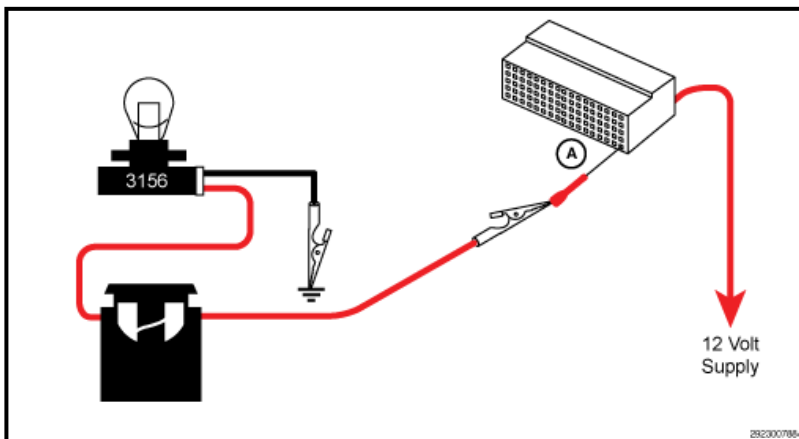
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [7](#)

No

- Check the applicable fuse. If the fuse is open, repair the short to ground in the (F946) Fused Ignition Run/Start Control Output circuit.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the Front Axle Disconnect (FAD) Actuator harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the FAD Actuator harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.

5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

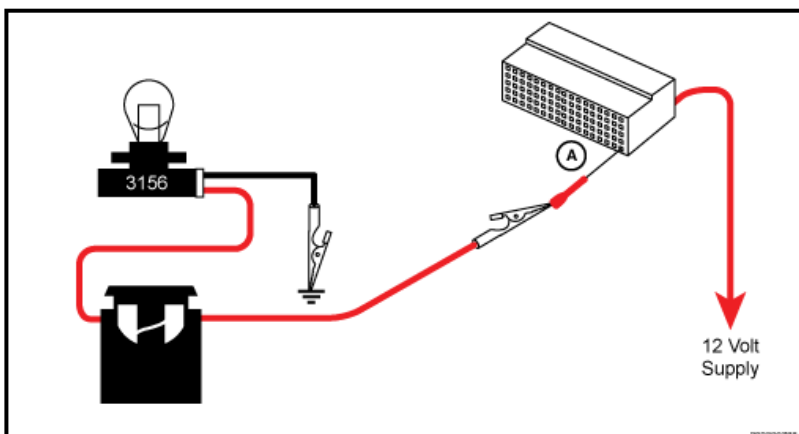
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** procedure in **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct

connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [8](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the HVAC VERIFICATION TEST. Refer to [HVAC VERIFICATION TEST](#) .

8. REPLACE THE FAD ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the FAD and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the FAD corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147B-92-FRONT AXLE DISCONNECT SENSOR-PERFORMANCE OR INCORRECT OPERATION

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Vehicle speed is more than 5 kph (3 mph).
- Engine speed is more than 700 rpm for more than 1 second.
- No other Front Axle Disconnect related electrical circuit DTCs set.
- No Electronic Control Unit (ECU) memory or Controller Area Network (CAN) DTCs set.

SET CONDITION

- Either of the following conditions are present:

- FAD is commanded to engage but the actual position, as indicated by the FAD position sensor feedback signal, is disengaged.
- FAD disengagement re-try count is greater than 100 over 5 key cycles.

DEFAULT ACTION

- This monitor will stop running once this DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FAD ACTUATOR: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FAD ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. REPLACE THE FAD ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the FAD and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the FAD corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147E-11-FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD

Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Either of the following conditions is present:
 - Fused Ignition Switch Output (Run) circuit voltage below 0.97 volt.
 - With Front Axle Disconnect (FAD) engaged: Drivetrain Control Module (DTCM) detects (F525) Fused Ignition Switch Output (Run) circuit current below 13.75 amps

DEFAULT ACTION

- Fused Ignition Switch Output (Run) circuit driver is commanded off while fault is present.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FAD: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Only available in LOW range or limited operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT SHORTED TO GROUND FAD ACTUATOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
 3. With the scan tool, erase DTCS.
 4. Turn the ignition off for at least 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C147E-12-FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.
- Front Axle Disconnect (FAD) is in OFF state (Disengaged)

SET CONDITION

- Fused Ignition Switch Output (Run) circuit voltage above 6.86 volts.

DEFAULT ACTION

- Fused Ignition Switch Output (Run) circuit driver is commanded off while fault is present.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FAD: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Only available in LOW range or limited operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT SHORTED TO VOLTAGE
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C149D-00-CLUTCH CALIBRATION NOT LEARNED

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- **CONDITION 1:**
 - Engine speed is above 700 rpm.
 - Controller Area Network (CAN) signals are valid (No CAN DTCs set).
 - No Front Axle Disconnect Actuator circuit DTCs set.
- **CONDITION 2:**
 - CAN signals are valid (No CAN DTCs set).

- No Front Axle Disconnect (FAD) circuit DTCs set.
- **CONDITION 3:**
 - Engine speed is above 700 rpm.
 - CAN signals are valid (No CAN DTCs set).
 - No FAD circuit DTCs set.
- **CONDITION 4:**
 - No Electronic Control Unit (ECU) memory DTCs set.
 - No FAD circuit DTCs set.

Set Conditions:

- **CONDITION 1 :** Initial Calibration at manufacturing End Of Line (EOL) either aborted or failed due to possible hardware fault preventing completion of learn routine.
- **CONDITION 2 :** Regular calibration routine to compensate for clutch wear did not complete for more than 20 key cycles. (Possible hardware fault preventing completion of learn routine.)
- **CONDITION 3:** Cannot find reference position for incremental position sensor despite 3 consecutive retries. Learn routine exceeded allowed time duration for completion. (Possible hardware fault preventing completion of learn routine.)
- **CONDITION 4 :** Initial calibration not performed after re-flash of Drivetrain Control Module (DTCM). (Manually request relearn with scan tool.)

Default Actions:

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Depending on failure conditions, disengage clutch and 2WD mode only, or lock clutch completely.
- FAD: Depending on failure conditions, FAD will be disengaged or engaged.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

WHEN MONITORED

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE/CLUTCH MECHANICAL ISSUE DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
 3. With the scan tool, erase DTCs.
 4. Turn the ignition off for at least 10.0 seconds.
 5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE TRANSFER CASE AND CLUTCH FOR MECHANICAL CONDITIONS

1. Check the Transfer Case and clutch for mechanical conditions that could cause the Clutch Learn routine to fail.

Were any problems found?

Yes

- Repair the Transfer Case/Clutch as necessary in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C149E-11-TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

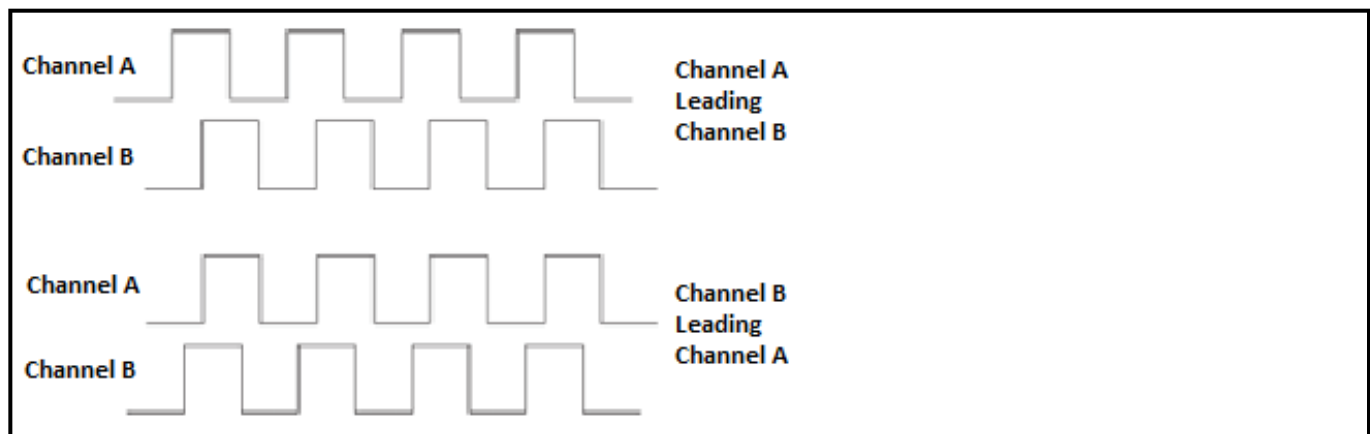
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module detects an Encoder Signal circuit voltage is less than 0.61 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO GROUND
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, REMOVAL AND INSTALLATION**](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C149E-12-TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO BATTERY

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

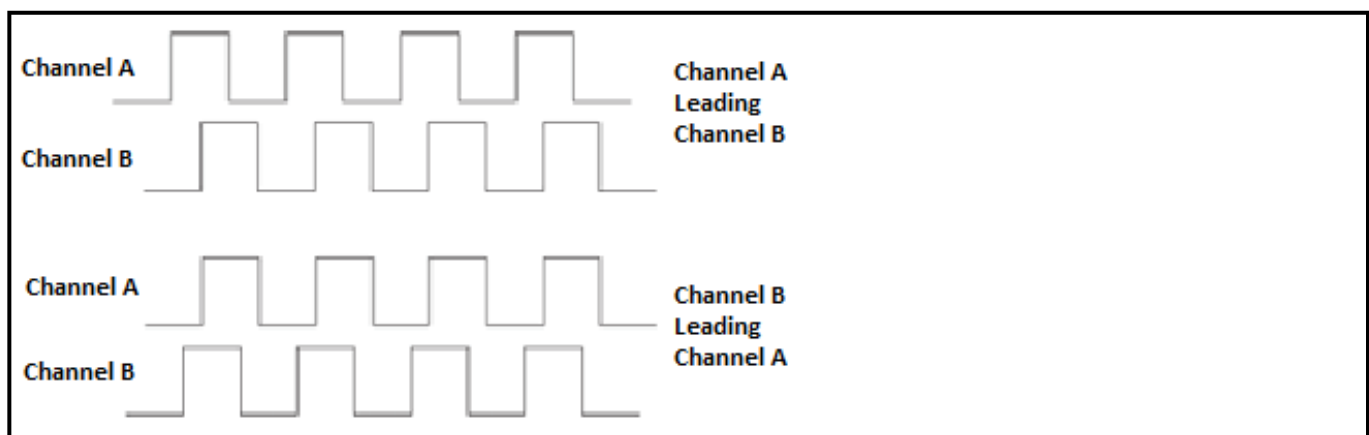
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (DTCM) detects an Encoder Signal circuit voltage is more than 4.88 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, REMOVAL AND INSTALLATION**](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#).
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

C149E-13-TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

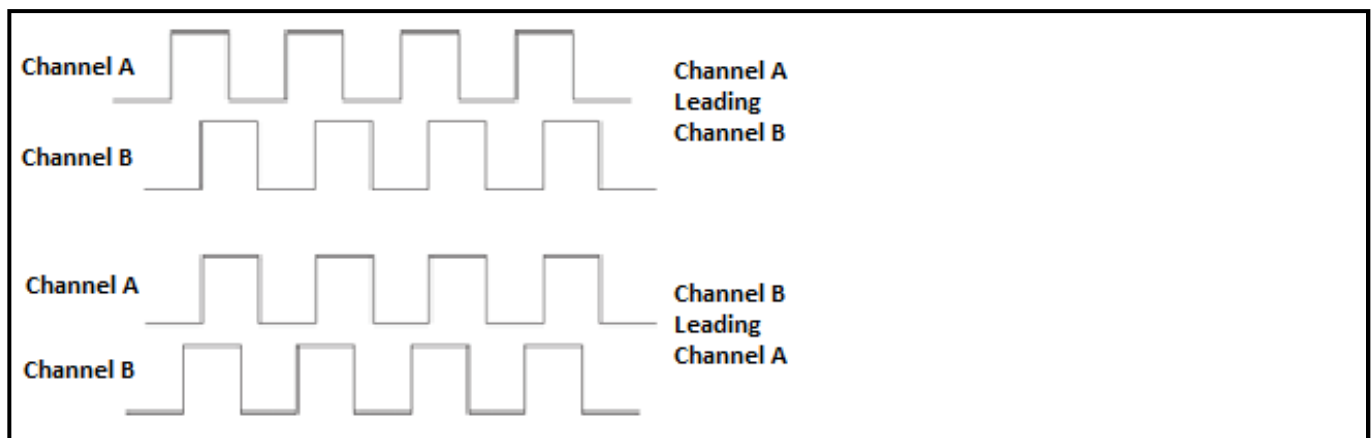
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (DTCM) detects an Encoder Signal circuit voltage is between 4.21 and 4.88 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.

- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector

terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, EMOVAL AND INSTALLATION](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C149E-64-TRANSFER CASE MOTOR POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

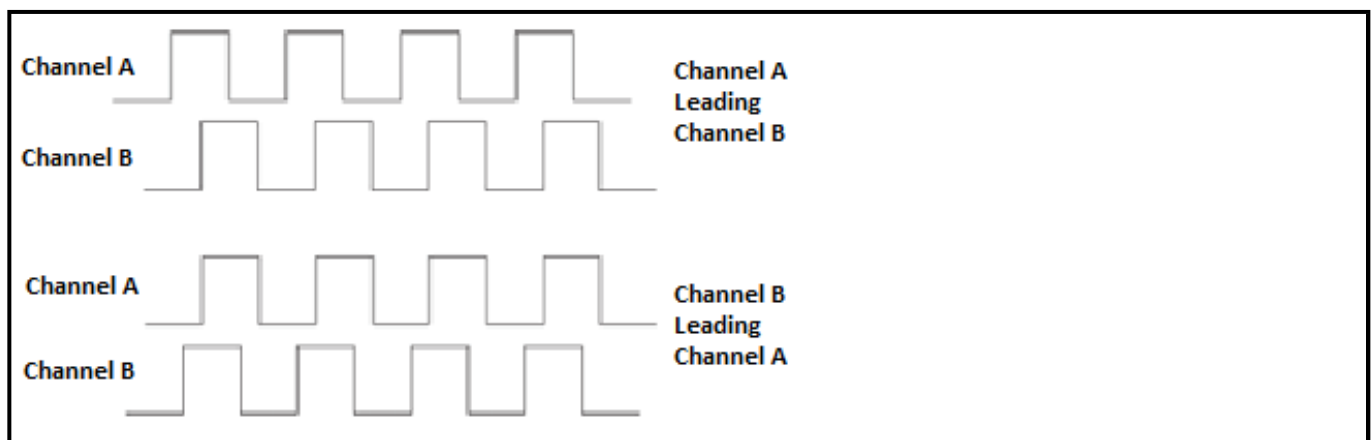
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (DTCM) does not detect pulses from one of the Encoder Signal circuits while there are more than 100 pulses on the other Encoder Signal circuit.

DEFAULT ACTION

- This monitor stops running while the DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 0 CIRCUIT
TRANSFER CASE ENCODER SIG 1 CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, EMOVAL AND INSTALLATION](#).
2. Connect the Transfer Case Shift Motor and DTCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C149E-94-TRANSFER CASE MOTOR POSITION SENSOR-UNEXPECTED OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

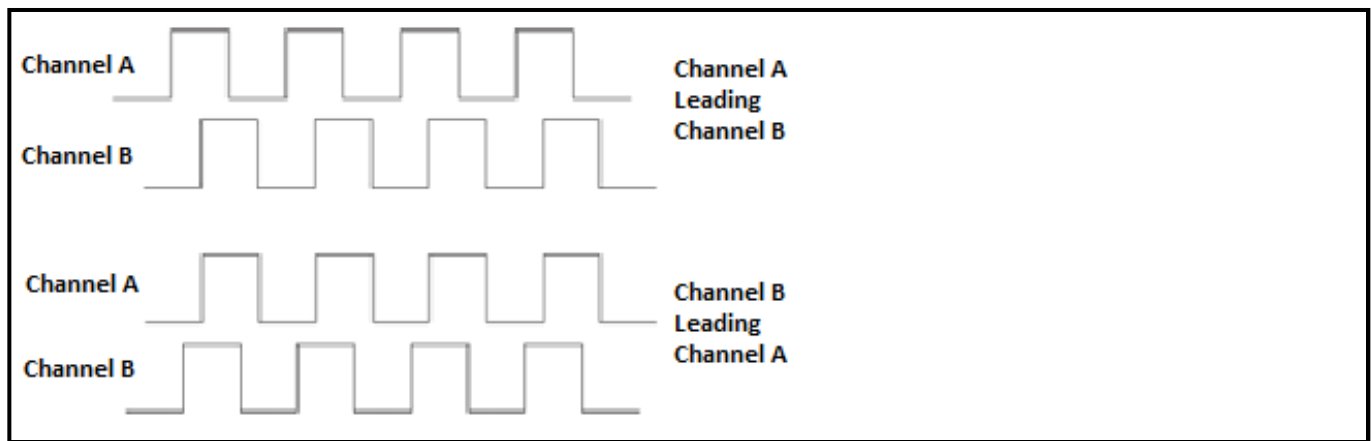
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for more than 1 second.
- No Controller Area Network (CAN) DTCs set.
- No Transfer Case Shift Motor circuit DTCs set.

SET CONDITION

- Drivetrain Control Module (DTCM) detects an Encoder Signal direction opposite of the commanded direction and the commanded direction was not changed in the last 50 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Maintain current position (H-bridge is commanded off).
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Maintain current state until clutch over-temp value. Reengage FAD when it is safe and clutch temperature is cooled down.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 0 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 0 CIRCUIT
TRANSFER CASE ENCODER SIG 1 CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, EMOVAL AND INSTALLATION](#) .
2. Connect the Transfer Case Shift Motor and DTCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [**MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

C14AA-11-TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

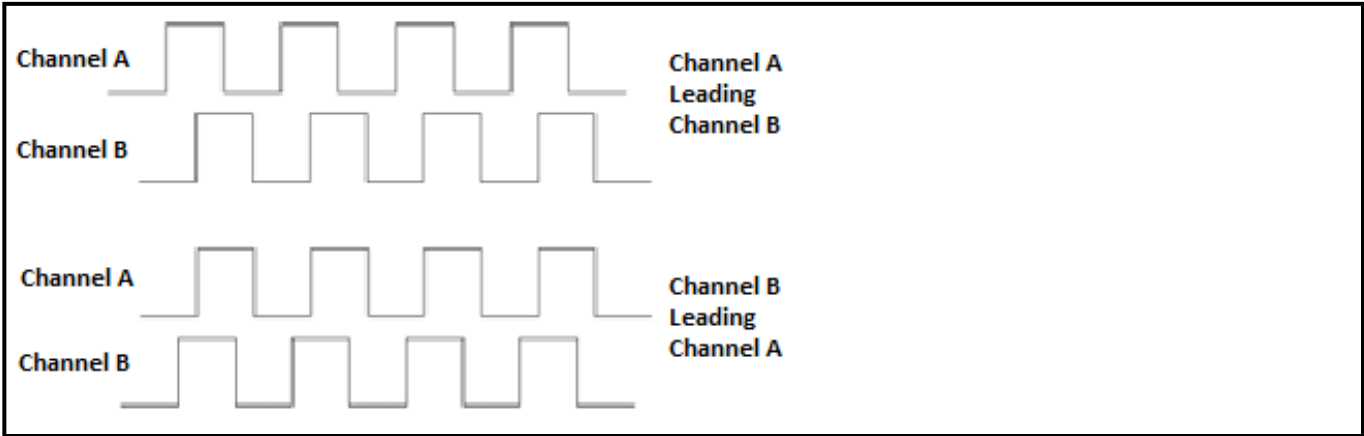
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second has elapsed since engine was cranked.
- No Under/Over system voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (K504) Drivetrain 5 Volt Supply circuit is being limited to between 100 and 400 mA. (This a default action of the 5-volt driver when it detects a short to ground.)

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT

Possible Causes
TRANSFER CASE SHIFT MOTOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION**.
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C14AA-12-TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO BATTERY

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

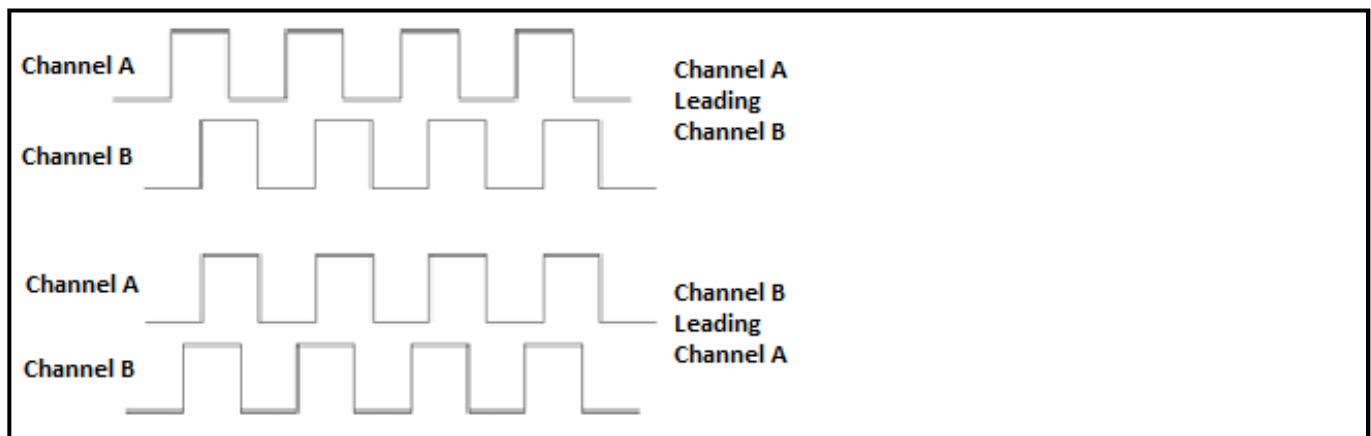
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second has elapsed since engine was cranked.
- No Under/Over system voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- (K504) Drivetrain 5 Volt Supply circuit voltage is above 5.4 volts for 0.25 second.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Transfer Case Shift Motor harness connector.
3. Turn the ignition on.

4. Measure voltage on the (K504) Drivetrain 5 Volt Supply circuit at the Transfer Case Shift Motor harness connector.

Is the voltage above 5.5 volts?

Yes

- Repair the (K504) Drivetrain 5 Volt Supply circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, EMOVAL AND INSTALLATION**](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C14AA-13-TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

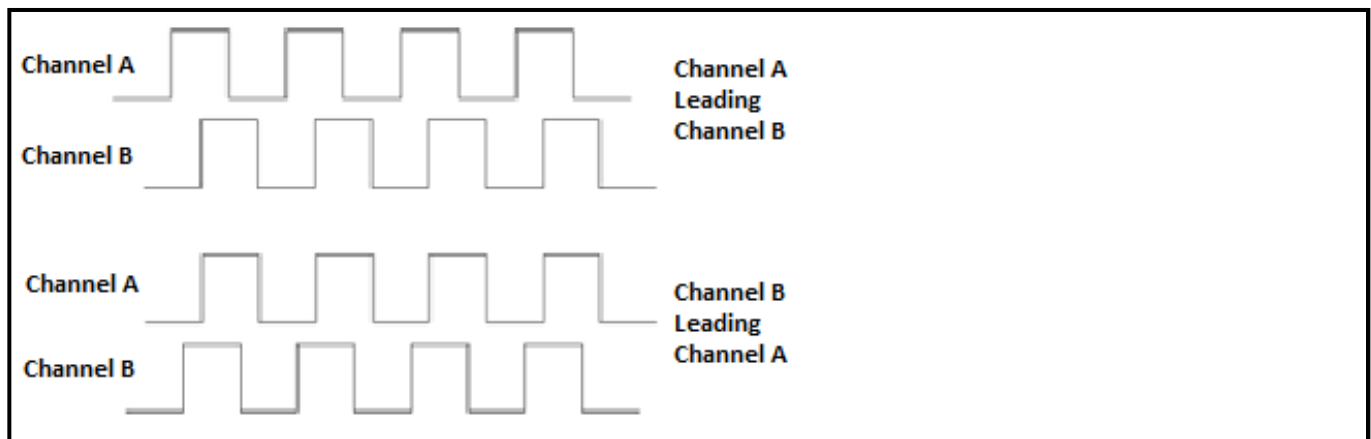
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second has elapsed since engine was cranked.
- No Under/Over system voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- (K504) Drivetrain 5 Volt Supply circuit is below 2 mA for 0.25 second.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

3. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, EMOVAL AND INSTALLATION**.
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C2129-16-BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Engine speed is above 500 rpm for more than 1 second.

SET CONDITION

- The Fused B(+) circuit voltage is less than 10.0 volts for 15 seconds or longer.

DEFAULT ACTION

- T-CASE SHIFTING: Close the clutch if in HI range. If in LO range, maintain that state.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: FAD requested to engage when safe (zero vehicle speed in PT).
- FRONT AXLE LOCKER ACTUATOR: Disabled.
- REAR AXLE LOCKER ACTUATOR: Disabled.

POSSIBLE CAUSES

Possible Causes
RELATED CHARGING SYSTEM DTCS PRESENT
FUSED B(+) CIRCUIT SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND POWERTRAIN CONTROL MODULE (PCM)

1. With the scan tool, check the BCM and PCM for Battery and Charging System DTCs.

Are any Battery or Charging System DTCs set?

Yes

- Perform PCM DTC diagnostic procedure(s). or BCM DTC diagnostic procedures. Refer to . Refer to **DIAGNOSIS AND TESTING** .

No

- Go To [3](#)

3. ISOLATE AND CHECK (A194) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To

4. CHECK THE (A194) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

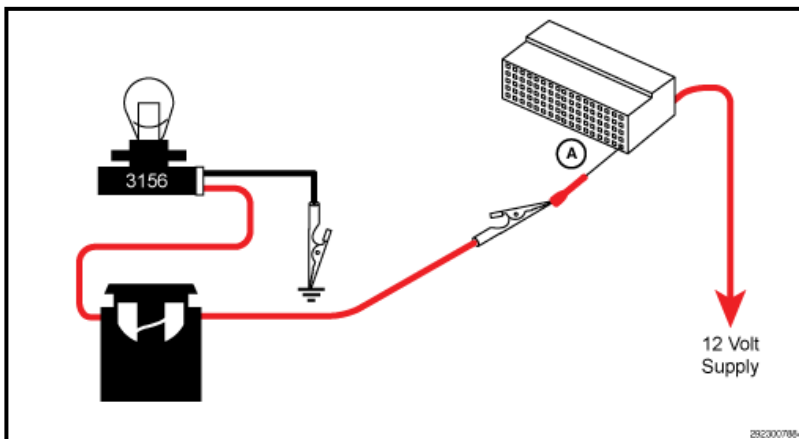
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

5. CHECK THE (Z916) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156

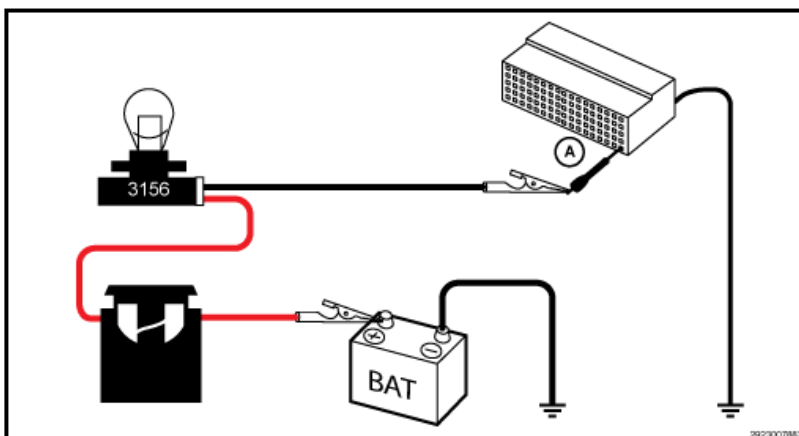
bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **LOAD TESTING A GROUND CIRCUIT** procedure in **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A GROUND CIRCUIT** procedure for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#) .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C2129-17-BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete TRANSFER CASE wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is above 500 rpm for 60 seconds.

SET CONDITION

- Battery Voltage is above 16.0 volts for 60 seconds.

DEFAULT ACTION

- T-CASE SHIFTING: T-Case Clutch will be engaged to 4WD HIGH lock position.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained. Shifting disabled
- FRONT AXLE LOCKER ACTUATOR: Disabled
- REAR AXLE LOCKER ACTUATOR: Disabled

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM DTCS PRESENT
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.

3. With the scan tool, erase DTCs.

4. Turn the ignition off for at least 10.0 seconds.

5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM DTCS

1. Refer to recorded DTCs.

Are any Charging System or related voltage DTCs set?

Yes

- Perform the appropriate diagnostic procedure. Refer to the appropriate service information .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C2201-00-FDCM-DTCM INTERNAL

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is between 6.0 and 16.0 volts.

SET CONDITION

- Drivetrain Control Module (DTCM) Checksum failure.
- DTCM Stack overflow.
- DTCM Sensor Supply regulator out of range
- DTCM flash memory corruption.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: System disabled.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: System disabled.
- FRONT AXLE LOCKER ACTUATOR: System disabled.
- REAR AXLE LOCKER ACTUATOR: System disabled.

POSSIBLE CAUSES

Possible Causes
DTCM

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C2206-00-VEHICLE CONFIGURATION MISMATCH

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

This Electronic Control Unit (ECU) compares the vehicle configuration stored in memory with the configuration information transmitted on the Controller Area Network (CAN) by other ECUs. If the vehicle configuration stored in memory does not match the information transmitted on the CAN, this DTC will set.

If the vehicle was recently repaired before this DTC was set, check that the ECU was programmed correctly and that the correct parts were installed on the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Engine is not being cranked.
- Vehicle operating voltage is between 6.0 and 16.0 volts for more than 500 ms.
- No Battery or Charging System under/over voltage DTCs set.

SET CONDITION

- Vehicle Configuration not correct or an Electronic Control Unit (ECU) was swapped from another vehicle.

POSSIBLE CAUSES

Possible Causes
VEHICLE CONFIGURATION NOT CORRECT
BODY CONTROL MODULE (BCM)
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK THE VEHICLE CONFIGURATION

NOTE: The DTC must be active and no BUS communication DTCs present before performing this test. If BUS communication DTCs are present, perform there respective test first. If the DTC is stored, erase the DTC and cycle the ignition. If the DTC resets and changes to active, then proceed.

1. With the scan tool, check the vehicle configuration stored in the Body Control Module (BCM).

2. With the scan tool, check the vehicle configuration stored in the Drivetrain Control Module (DTCM).

Pick the answer that best describes your findings:

BCM has wrong or no vehicle configuration.

- With the scan tool, program the proper vehicle configuration in the BCM.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

DTCM has wrong vehicle configuration but BCM has correct configuration.

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), EMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

U0001-00-CAN C BUS

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [DIAGNOSIS AND TESTING](#) .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: Perform this diagnostic procedure **ONLY** when the DTC status is "Active". If the DTC status is "Stored" **DO NOT** proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0212-00-LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0401-00-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0402-00-INVALID DATA RECEIVED FROM TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0415-00-IMPLAUSIBLE DATA RECEIVED FROM ABS

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0429-00-IMPLAUSIBLE DATA RECEIVED FROM SCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - DTCS C1477-4B To U0429-00 - Gladiator

DTC TROUBLESHOOTING

C1477-4B-TRANSFER CASE CLUTCH-OVER TEMPERATURE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

Active Transfer Case (DHP and DHF) - Shift Motor Operation

The Shift Motor is a serviceable component of the Transfer Case. There are two Control circuits between the Shift Motor and DTCM:

- Shift Motor Control A
- Shift Motor Control B

The Shift Motor turns a worm gear that in turn rotates a mechanical ramp style clutch actuator to apply and release the Front Drive Clutch.

The Shift Motor is used to apply and release the Front Drive Clutch in 2WD, 4WD, and 4WD-AUTO modes as follows:

- **2WD Mode:** The Front drive Clutch is released. No actuation of the clutch will occur and all torque is applied the Rear Axle.
- **4WD HIGH and 4WD LOW Modes:** The Front Drive Clutch will be applied at all times. Torque is split 50/50 between the Front and Rear Axles. However, the clutch is still actively controlled depending on engine torque. At a minimum, the clutch will be applied with 800 Nm of force. If engine torque increases, the DTCM will command the Shift Motor to increase clutch force up to 1600 Nm. Increasing the clutch force only when needed extends the life of the Front Drive Clutch, Clutch Actuator, and other Transfer Case components.
- **4WD-AUTO Mode:** The DTCM will automatically modulate the torque between the front and rear axles according to traction conditions by modulating the Front Drive Clutch. The ABS Wheel Speed Sensors are monitored via CAN communication to determine traction conditions.

The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for 1 second.
- No Controller Area Network (CAN) Bus DTCs.

SET CONDITION

- Predicted transfer case clutch temperature is more than a safe value.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: T-Case Clutch position will be maintained.

- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained unless an over temperature condition is detected.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
EXTREME DRIVING CONDITIONS INTERNAL TRANSFER CASE FAILURE DRIVELINE FAILURE (PROPSHAFT, AXLE, OTHER) AMBIENT AIR TEMPERATURE (AAT) SENSOR PROBLEM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK AMBIENT AIR TEMPERATURE (AAT) SENSOR VALUE

1. With the scan tool, read the AAT Sensor value in the Body Control Module (BCM) data list.

Is the ambient air temperature value accurate?

Yes

- Go To [3](#)

No

- Check the AAT Sensor circuits for an open, high resistance, and shorts. If no problems are found, replace the AAT Sensor in accordance with the Service Information.
- Perform the TRANSFER CASE VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

3. CHECK TRANSFER CASE FLUID LEVEL

1. Check the Transfer Case fluid level in accordance with the Service Information. Refer to the appropriate service information .

Is the fluid at the correct level?

Yes

- Go To [4](#)

No

- Check the Transfer Case for leaks and fill to the proper level.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK DRIVELINE COMPONENT OPERATION

1. Raise and support the vehicle with all four wheels off the ground. Refer to [HOISTING, STANDARD PROCEDURE](#) .
2. Start the engine, place the transfer case in 4WD HI and shift Transmission into DRIVE.

NOTE: All four wheels should be spinning at the same speed.

3. Shift the Transfer Case into 4WD LOW in accordance with the Owners Service Information

NOTE: All four wheels should be spinning at the same speed.

Do all four wheels spin at the same speed?

Yes

- Go To [5](#)

No

- Repair the affected driveline component in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. VERIFY DRIVING CONDITIONS

NOTE: Check with customer on driving terrain (e.g. mud, sand, snow) for set condition. Operating the vehicle in a manner that causes the clutch to engage/disengage too many times in a short time period will also cause this DTC to set.

1. With the scan tool, erase DTCs.
2. Allow the Transfer Case to cool down.
3. Test drive vehicle on dry paved road.
4. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Extreme driving conditions caused DTC to set.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. PERFORM A NON-VOLITILE MEMORY RESET AND CHECK FOR THE DTC TO RETURN

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. Shift the Transfer case into 2WD.
4. With the scan tool, perform the "Non-Volatile Memory Reset (Clear T-Case Adaptives)" routine.
5. Turn the ignition off for 10 seconds, then turn ignition on. (Do not perform any Transfer Case shifts.)

NOTE: When the ignition is turned back on, the Drivetrain Control Module (DTCM) will perform a Clutch Learn.

6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- The Reset and Clutch Learn has corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Repair or replace the Transfer Case as necessary in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C147B-12-FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Front Axle Lock Signal circuit voltage is more than 7.22 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.

- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. MEASURE VOLTAGE ON THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT WITH THE DTCM CONNECTED AND IGNITION ON

NOTE: **Leave the Front Axle Disconnect (FAD) Actuator harness connector disconnected.**

1. Connect the DTCM harness connector.
2. Turn the ignition on.
3. Measure voltage on the (G303) Front Axle Lock Signal circuit at the FAD harness connector.

Is the voltage above 7.22 volts?

Yes

- Go To [4](#)

No

- Replace the FAD Actuator in accordance with the Service Information. .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147B-14-FRONT AXLE DISCONNECT SENSOR-CIRCUIT SHORT TO GROUND OR OPEN

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Front Axle Lock Signal circuit voltage is below 1.19 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.

- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FRONT AXLE LOCK SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
FRONT AXLE LOCK SIGNAL CIRCUIT SHORTED TO GROUND
FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT OPEN OR SHORTED TO GROUND
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED TO GROUND
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show **disengaged**.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [6](#)

4. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE (F946) FUSED IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

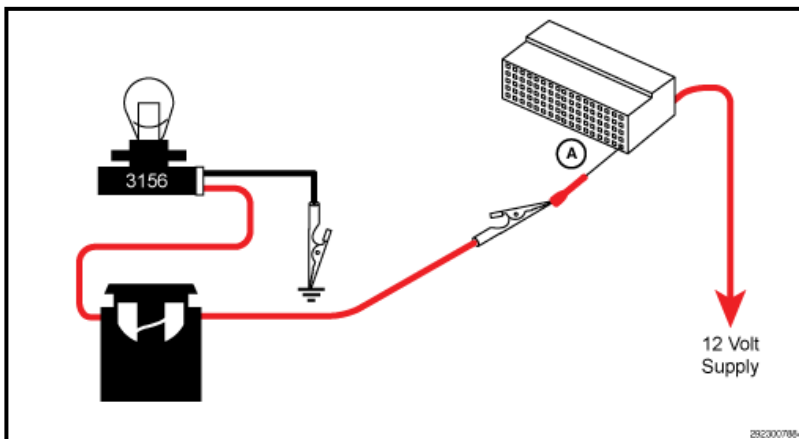
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE** .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [7](#)

No

- Check the applicable fuse. If the fuse is open, repair the short to ground in the (F946) Fused Ignition Run/Start Control Output circuit.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the Front Axle Disconnect (FAD) Actuator harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the FAD Actuator harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.

5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

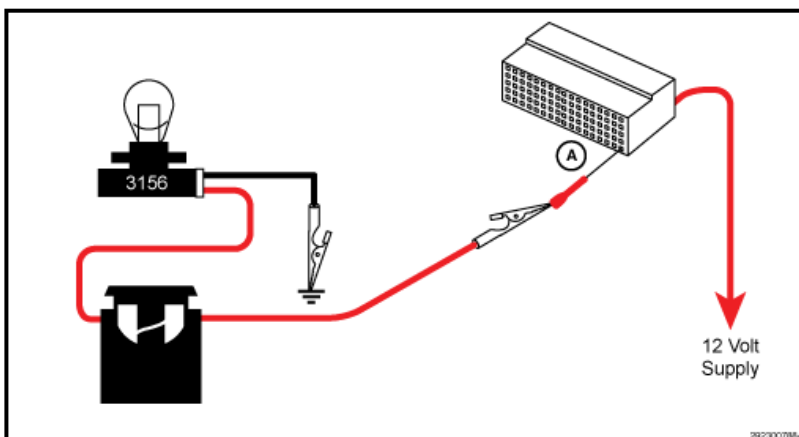
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** procedure in **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct

connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [8](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the HVAC VERIFICATION TEST. Refer to [HVAC VERIFICATION TEST](#) .

8. REPLACE THE FAD ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the FAD and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the FAD corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147B-92-FRONT AXLE DISCONNECT SENSOR-PERFORMANCE OR INCORRECT OPERATION

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Vehicle speed is more than 5 kph (3 mph).
- Engine speed is more than 700 rpm for more than 1 second.
- No other Front Axle Disconnect related electrical circuit DTCs set.
- No Electronic Control Unit (ECU) memory or Controller Area Network (CAN) DTCs set.

SET CONDITION

- Either of the following conditions are present:

- FAD is commanded to engage but the actual position, as indicated by the FAD position sensor feedback signal, is disengaged.
- FAD disengagement re-try count is greater than 100 over 5 key cycles.

DEFAULT ACTION

- This monitor will stop running once this DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FAD ACTUATOR: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FAD ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REVIEW FAD SCAN TOOL DATA

1. The ignition must be on, with engine off when performing this test.
2. Place vehicle in park and 2wd selection.
3. Under the DTCM listing, locate the FAD actuator status under the data tab.

NOTE: Under the conditions listed above the FAD status should show disengaged.

Does the scan tool show a disengaged status?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. FRONT AXLE DISCONNECT ACTUATOR TEST

1. The ignition must be on when performing this test.
2. Raise the vehicle on a frame lift.
3. Locate the FAD actuator wiring connector.
4. Back probe the (G304) Circuit at the FAD connector, using a suitable back probing tool connected to a good ground source.

NOTE: You should hear the FAD motor actuate engaging the FAD.

Did you hear the FAD Actuate ?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

5. ISOLATE AND CHECK THE (G303) FRONT AXLE LOCK SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. REPLACE THE FAD ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the FAD and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the FAD corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147E-11-FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO GROUND

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD

Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.

SET CONDITION

- Either of the following conditions is present:
 - Fused Ignition Switch Output (Run) circuit voltage below 0.97 volt.
 - With Front Axle Disconnect (FAD) engaged: Drivetrain Control Module (DTCM) detects (F525) Fused Ignition Switch Output (Run) circuit current below 13.75 amps

DEFAULT ACTION

- Fused Ignition Switch Output (Run) circuit driver is commanded off while fault is present.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FAD: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Only available in LOW range or limited operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT SHORTED TO GROUND FAD ACTUATOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
 3. With the scan tool, erase DTCS.
 4. Turn the ignition off for at least 10.0 seconds.
 5. Turn the ignition on.
 6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C147E-12-FRONT AXLE DISCONNECT POWER SUPPLY-CIRCUIT SHORT TO BATTERY

For a complete AXLE LOCKER SYSTEM wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

Front Axle Disconnect (FAD) Actuator

When the vehicle is in 2WD, the FAD system prevents the front axle ring gear, pinion gear, front drive shaft, and the front drive components in the transfer case from spinning. This allows for better fuel economy and reduced wear of the Front Axle and Transfer Case components. There are four circuits between the FAD Actuator and the Drivetrain Control Module (DTCM):

- Fused Ignition
- Front Axle Lock control
- Front Axle Lock Signal
- Ground

When 4WD is requested, the DTCM grounds the Front Axle Lock control circuit. This causes the actuator to move a fork that slides a sleeve over the right axle shaft and a stub axle shaft linking them together. The FAD Actuator sends a signal back to the DTCM to indicate the fork position.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is within normal range.
- Front Axle Disconnect (FAD) is in OFF state (Disengaged)

SET CONDITION

- Fused Ignition Switch Output (Run) circuit voltage above 6.86 volts.

DEFAULT ACTION

- Fused Ignition Switch Output (Run) circuit driver is commanded off while fault is present.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Limited operation or clutch will be disengaged.
- FAD: Maintain current position.
- FRONT AXLE LOCKER ACTUATOR: Only available in LOW range or limited operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT SHORTED TO VOLTAGE
FAD ACTUATOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (F525) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. REPLACE THE FRONT AXLE DISCONNECT (FAD) ACTUATOR AND CHECK FOR THE DTC TO RETURN

1. Replace the FAD Actuator in accordance with the Service Information. .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the FAD Actuator corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION** .
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST** .

C149D-00-CLUTCH CALIBRATION NOT LEARNED

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- **CONDITION 1:**
 - Engine speed is above 700 rpm.
 - Controller Area Network (CAN) signals are valid (No CAN DTCs set).
 - No Front Axle Disconnect Actuator circuit DTCs set.
- **CONDITION 2:**
 - CAN signals are valid (No CAN DTCs set).

- No Front Axle Disconnect (FAD) circuit DTCs set.
- **CONDITION 3:**
 - Engine speed is above 700 rpm.
 - CAN signals are valid (No CAN DTCs set).
 - No FAD circuit DTCs set.
- **CONDITION 4:**
 - No Electronic Control Unit (ECU) memory DTCs set.
 - No FAD circuit DTCs set.

Set Conditions:

- **CONDITION 1 :** Initial Calibration at manufacturing End Of Line (EOL) either aborted or failed due to possible hardware fault preventing completion of learn routine.
- **CONDITION 2 :** Regular calibration routine to compensate for clutch wear did not complete for more than 20 key cycles. (Possible hardware fault preventing completion of learn routine.)
- **CONDITION 3:** Cannot find reference position for incremental position sensor despite 3 consecutive retries. Learn routine exceeded allowed time duration for completion. (Possible hardware fault preventing completion of learn routine.)
- **CONDITION 4 :** Initial calibration not performed after re-flash of Drivetrain Control Module (DTCM). (Manually request relearn with scan tool.)

Default Actions:

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Depending on failure conditions, disengage clutch and 2WD mode only, or lock clutch completely.
- FAD: Depending on failure conditions, FAD will be disengaged or engaged.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

WHEN MONITORED

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE/CLUTCH MECHANICAL ISSUE DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
 3. With the scan tool, erase DTCs.
 4. Turn the ignition off for at least 10.0 seconds.
 5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE TRANSFER CASE AND CLUTCH FOR MECHANICAL CONDITIONS

1. Check the Transfer Case and clutch for mechanical conditions that could cause the Clutch Learn routine to fail.

Were any problems found?

Yes

- Repair the Transfer Case/Clutch as necessary in accordance with the Service Information.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#).
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

C149E-11-TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

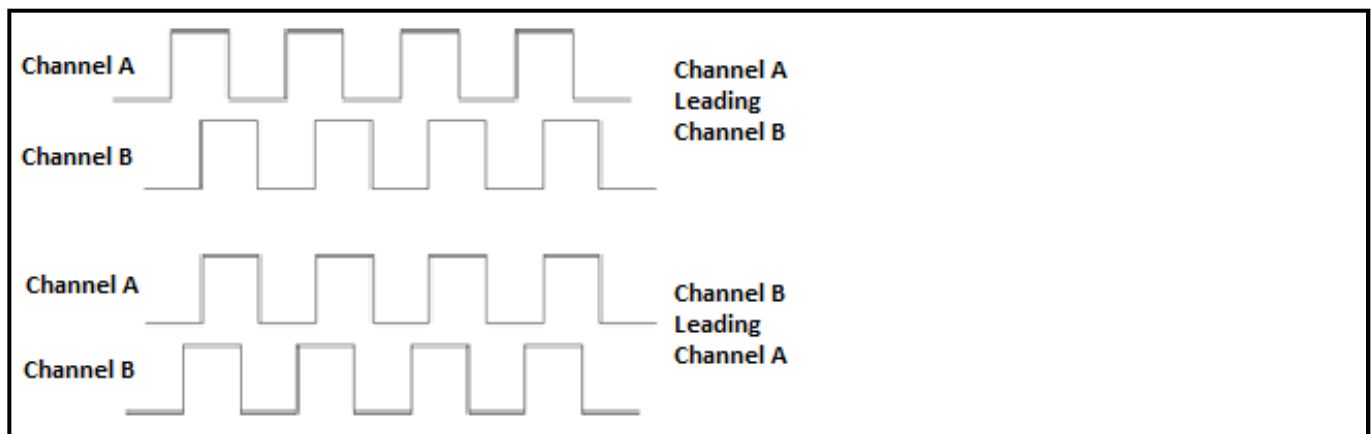
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module detects an Encoder Signal circuit voltage is less than 0.61 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO GROUND
TRANSFER CASE SHIFT MOTOR
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C149E-12-TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT SHORT TO BATTERY

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

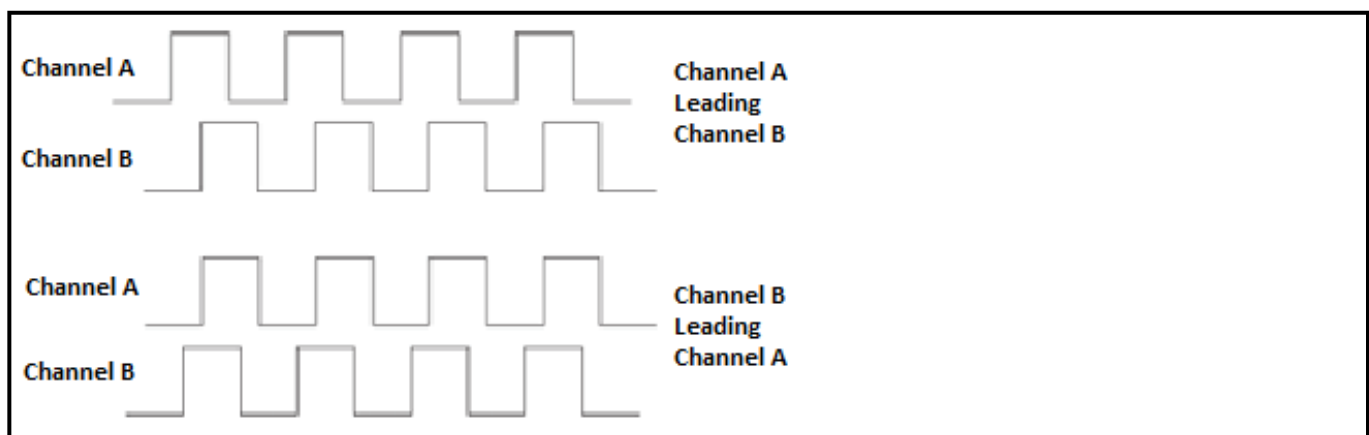
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (DTCM) detects an Encoder Signal circuit voltage is more than 4.88 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Turn the ignition on, engine not running.
4. Measure voltage on the circuit being tested.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, EMOVAL AND INSTALLATION**](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C149E-13-TRANSFER CASE MOTOR POSITION SENSOR-CIRCUIT OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

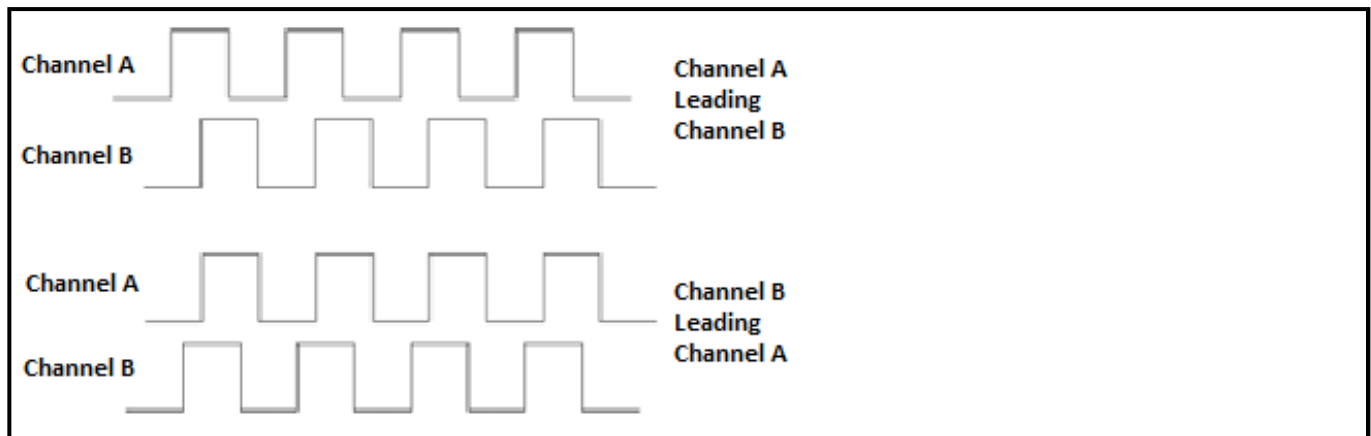
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (DTCM) detects an Encoder Signal circuit voltage is between 4.21 and 4.88 volts for more than 500 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.

- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector

terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, EMOVAL AND INSTALLATION](#) .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [**MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

C149E-64-TRANSFER CASE MOTOR POSITION SENSOR-SIGNAL PLAUSIBILITY FAILURE

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

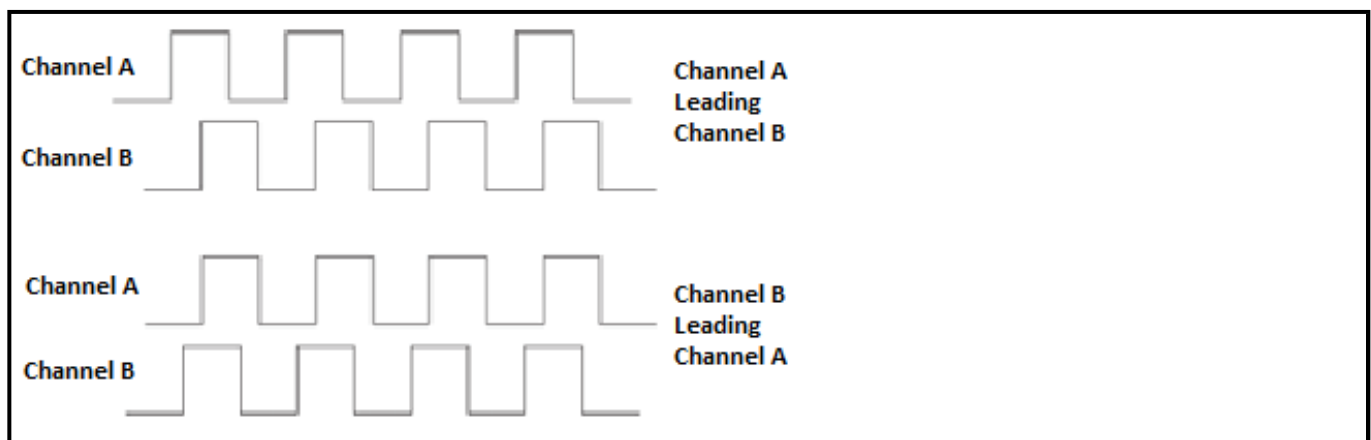
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second elapsed since engine was cranked.
- Drivetrain 5 Volt Supply circuit voltage is within normal range.
- No Drivetrain 5 Volt Supply circuit DTCs set.
- No Under/Over system voltage DTCs set.
- System voltage is between 6 and 16 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (DTCM) does not detect pulses from one of the Encoder Signal circuits while there are more than 100 pulses on the other Encoder Signal circuit.

DEFAULT ACTION

- This monitor stops running while the DTC is set for the current ignition cycle.
- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 0 CIRCUIT
TRANSFER CASE ENCODER SIG 1 CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#).
2. Connect the Transfer Case Shift Motor and DTCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C149E-94-TRANSFER CASE MOTOR POSITION SENSOR-UNEXPECTED OPERATION

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

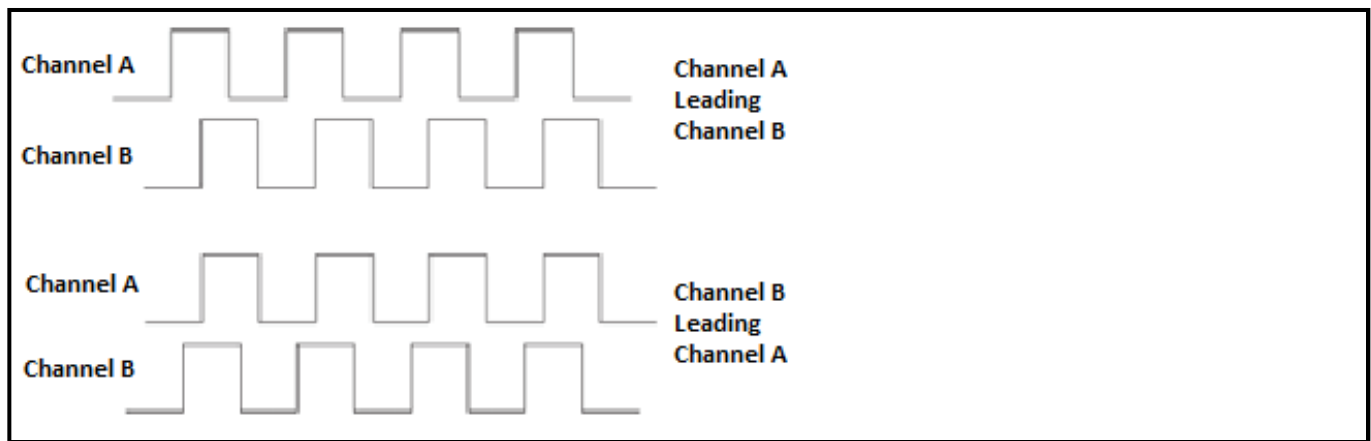
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is more than 700 rpm for more than 1 second.
- No Controller Area Network (CAN) DTCs set.
- No Transfer Case Shift Motor circuit DTCs set.

SET CONDITION

- Drivetrain Control Module (DTCM) detects an Encoder Signal direction opposite of the commanded direction and the commanded direction was not changed in the last 50 ms.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Maintain current position (H-bridge is commanded off).
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Maintain current state until clutch over-temp value. Reengage FAD when it is safe and clutch temperature is cooled down.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
TRANSFER CASE ENCODER SIG 0 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 1 CIRCUIT SHORTED TO GROUND
TRANSFER CASE ENCODER SIG 0 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 1 CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE ENCODER SIG 0 CIRCUIT
TRANSFER CASE ENCODER SIG 1 CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: If any Motor Position or Encoder Position circuit DTCs are set, perform those troubleshooting procedures first.

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (T307) TRANSFER CASE ENCODER SIG 0 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. ISOLATE AND CHECK THE (T308) TRANSFER CASE ENCODER SIG 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DTCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [MOTOR, SHIFT, REMOVAL AND INSTALLATION](#) .
2. Connect the Transfer Case Shift Motor and DTCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [**MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

C14AA-11-TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO GROUND

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

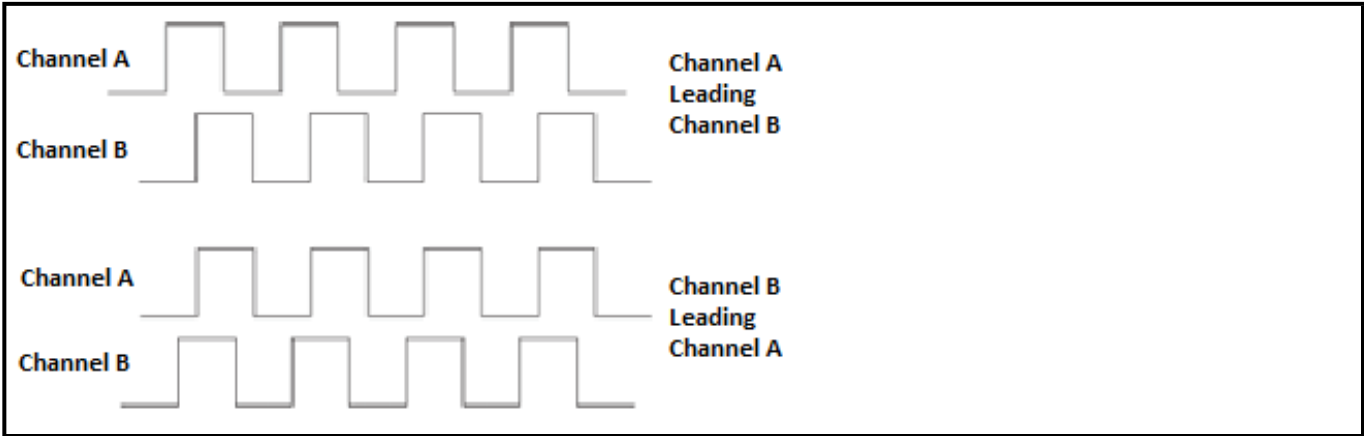
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second has elapsed since engine was cranked.
- No Under/Over system voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- Drivetrain Control Module (K504) Drivetrain 5 Volt Supply circuit is being limited to between 100 and 400 mA. (This a default action of the 5-volt driver when it detects a short to ground.)

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT

Possible Causes
TRANSFER CASE SHIFT MOTOR DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, REMOVAL AND INSTALLATION**.
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C14AA-12-TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT SHORT TO BATTERY

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

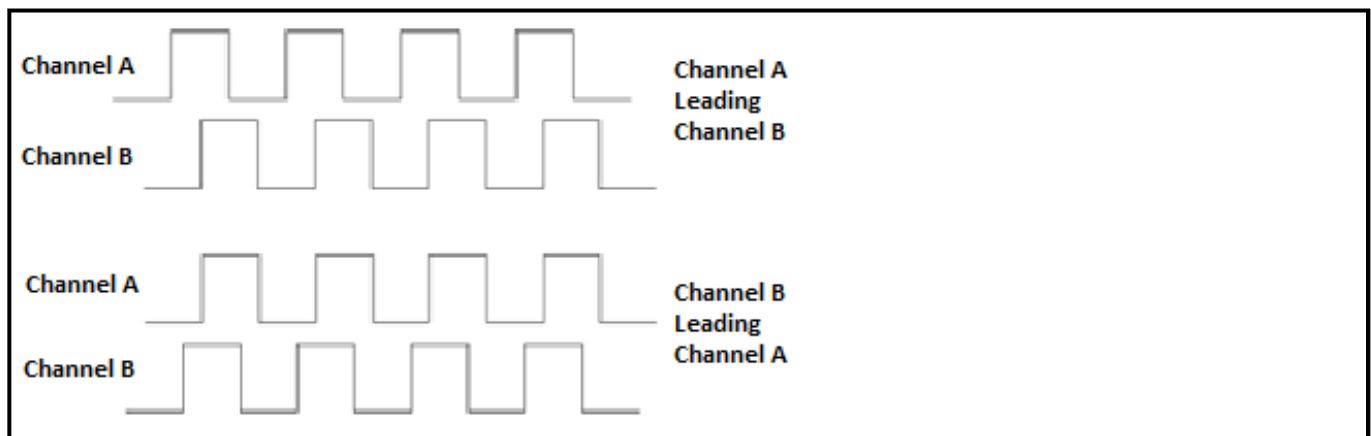
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second has elapsed since engine was cranked.
- No Under/Over system voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- (K504) Drivetrain 5 Volt Supply circuit voltage is above 5.4 volts for 0.25 second.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT SHORTED TO ANOTHER CIRCUIT
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Transfer Case Shift Motor harness connector.
3. Turn the ignition on.

4. Measure voltage on the (K504) Drivetrain 5 Volt Supply circuit at the Transfer Case Shift Motor harness connector.

Is the voltage above 5.5 volts?

Yes

- Repair the (K504) Drivetrain 5 Volt Supply circuit for a short to voltage.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE DRIVETRAIN CONTROL MODULE (DTCM) HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the circuit for a short to another circuit. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [**DTCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to [**MOTOR, SHIFT, EMOVAL AND INSTALLATION**](#) .
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all DTCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C14AA-13-TRANSFER CASE MOTOR POSITION SENSOR SUPPLY-CIRCUIT OPEN

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

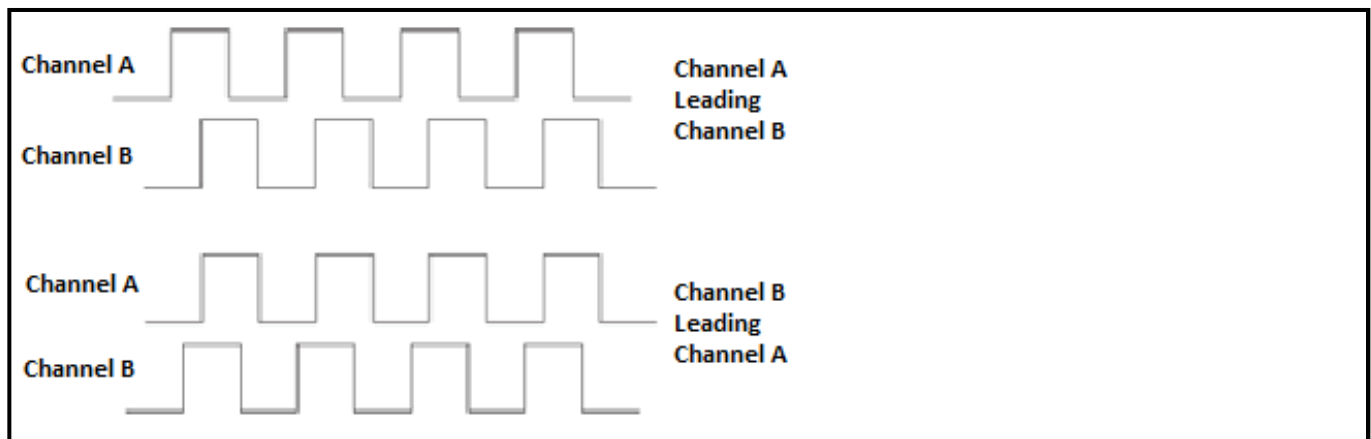
Active Transfer Case (DHP and DHF) - Shift Motor Position Sensing

The Transfer Case Shift Motor is equipped with magnets on the armature that rotate past two hall effect sensors when the motor is turning. The Drivetrain Control Module (DTCM) counts the pulses in order to determine the relative position of the Front Drive Clutch (2WD, 4WD, and 4WD-AUTO modes) inside the Transfer Case.

There are 4 Hall-Effect Sensor related circuits between the Shift Motor and the DTCM:

- 5-Volt Supply
- Sensor Ground
- Hall-Effect Sensor A Signal
- Hall-Effect Sensor B Signal

Each sensor creates a square wave signal that is slightly offset from one another. This allows the DTCM to determine which direction the motor is turning. If the DTCM determines that some of the square wave pulses are missing, a DTC will be set. Once the fault condition is corrected, a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool is required to relearn the motor positions.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on or 1 second has elapsed since engine was cranked.
- No Under/Over system voltage DTCs set.
- System voltage is between 6.0 and 16.0 volts for 500 ms.

SET CONDITION

- (K504) Drivetrain 5 Volt Supply circuit is below 2 mA for 0.25 second.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: Clutch will be locked if in 4WD.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Normal Operation.
- FRONT AXLE LOCKER ACTUATOR: Normal Operation.
- REAR AXLE LOCKER ACTUATOR: Normal Operation.

POSSIBLE CAUSES

Possible Causes
DRIVETRAIN 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
TRANSFER CASE SHIFT MOTOR
DTCM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (K504) DRIVETRAIN 5 VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

3. REPLACE THE TRANSFER CASE SHIFT MOTOR AND CHECK FOR THE DTC TO RETURN

1. Replace the Transfer Case Shift Motor in accordance with the Service Information. Refer to **MOTOR, SHIFT, EMOVAL AND INSTALLATION**.
2. Connect the Transfer Case Shift Motor and all other harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Environmental Data and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the Transfer Case Shift Motor corrected the condition.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C2129-16-BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Engine speed is above 500 rpm for more than 1 second.

SET CONDITION

- The Fused B(+) circuit voltage is less than 10.0 volts for 15 seconds or longer.

DEFAULT ACTION

- T-CASE SHIFTING: Close the clutch if in HI range. If in LO range, maintain that state.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: FAD requested to engage when safe (zero vehicle speed in PT).
- FRONT AXLE LOCKER ACTUATOR: Disabled.
- REAR AXLE LOCKER ACTUATOR: Disabled.

POSSIBLE CAUSES

Possible Causes
RELATED CHARGING SYSTEM DTCS PRESENT
FUSED B(+) CIRCUIT SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND POWERTRAIN CONTROL MODULE (PCM)

1. With the scan tool, check the BCM and PCM for Battery and Charging System DTCs.

Are any Battery or Charging System DTCs set?

Yes

- Perform PCM DTC diagnostic procedure(s). or BCM DTC diagnostic procedures. Refer to . Refer to **DIAGNOSIS AND TESTING** .

No

- Go To [3](#)

3. ISOLATE AND CHECK (A194) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#).

No

- Go To

4. CHECK THE (A194) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [STANDARD PROCEDURE](#).

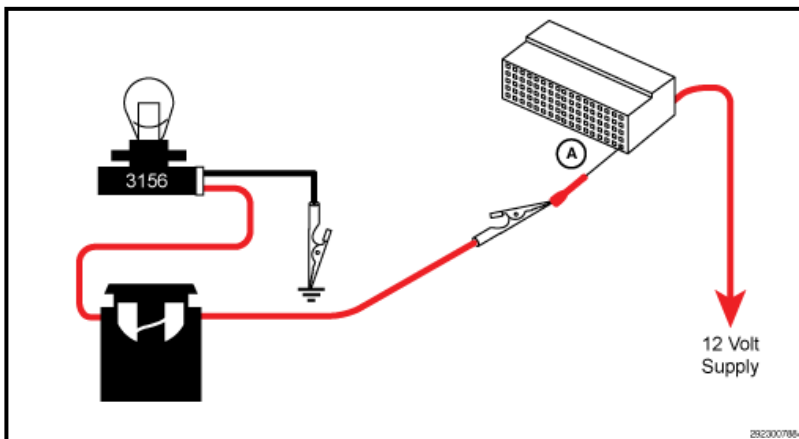
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **STANDARD PROCEDURE**.



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

5. CHECK THE (Z916) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156

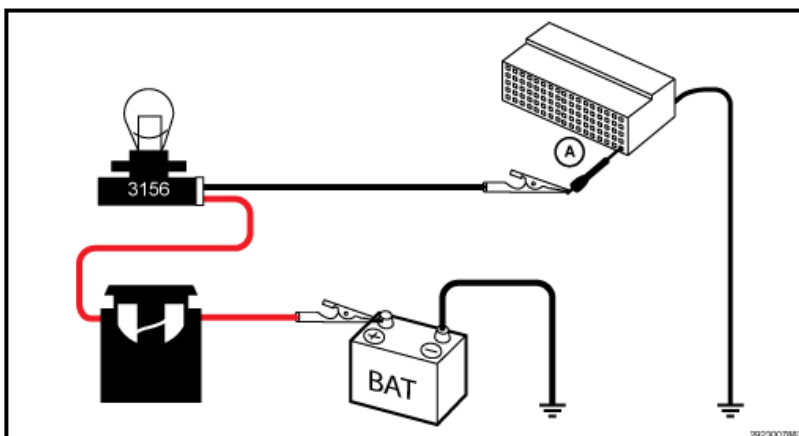
bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **LOAD TESTING A GROUND CIRCUIT** procedure in **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A GROUND CIRCUIT** procedure for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**STANDARD PROCEDURE**](#).



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C2129-17-BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete TRANSFER CASE wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine speed is above 500 rpm for 60 seconds.

SET CONDITION

- Battery Voltage is above 16.0 volts for 60 seconds.

DEFAULT ACTION

- T-CASE SHIFTING: T-Case Clutch will be engaged to 4WD HIGH lock position.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: Current state will be maintained. Shifting disabled
- FRONT AXLE LOCKER ACTUATOR: Disabled
- REAR AXLE LOCKER ACTUATOR: Disabled

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM DTCS PRESENT
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
 3. With the scan tool, erase DTCs.
 4. Turn the ignition off for at least 10.0 seconds.
 5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM DTCS

1. Refer to recorded DTCs.

Are any Charging System or related voltage DTCs set?

Yes

- Perform the appropriate diagnostic procedure. Refer to the appropriate service information .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to **MODULE, DRIVETRAIN CONTROL (DTCM), REMOVAL AND INSTALLATION**.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to **DTCM VERIFICATION TEST**.

C2201-00-FDCM-DTCM INTERNAL

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Battery voltage is between 6.0 and 16.0 volts.

SET CONDITION

- Drivetrain Control Module (DTCM) Checksum failure.
- DTCM Stack overflow.
- DTCM Sensor Supply regulator out of range
- DTCM flash memory corruption.

DEFAULT ACTION

- Service telltale lamp will be illuminated and on-screen message to service 4WD system will be displayed.
- T-CASE SHIFTING: System disabled.
- FRONT AXLE DISCONNECT (FAD) ACTUATOR: System disabled.
- FRONT AXLE LOCKER ACTUATOR: System disabled.
- REAR AXLE LOCKER ACTUATOR: System disabled.

POSSIBLE CAUSES

Possible Causes
DTCM

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Drivetrain Control Module (DTCM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all DTCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCM DTCs.

Did the DTC return?

Yes

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), REMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

C2206-00-VEHICLE CONFIGURATION MISMATCH

For a complete TRANSFER CASE wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

This Electronic Control Unit (ECU) compares the vehicle configuration stored in memory with the configuration information transmitted on the Controller Area Network (CAN) by other ECUs. If the vehicle configuration stored in memory does not match the information transmitted on the CAN, this DTC will set.

If the vehicle was recently repaired before this DTC was set, check that the ECU was programmed correctly and that the correct parts were installed on the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- Engine is not being cranked.
- Vehicle operating voltage is between 6.0 and 16.0 volts for more than 500 ms.
- No Battery or Charging System under/over voltage DTCs set.

SET CONDITION

- Vehicle Configuration not correct or an Electronic Control Unit (ECU) was swapped from another vehicle.

POSSIBLE CAUSES

Possible Causes
VEHICLE CONFIGURATION NOT CORRECT
BODY CONTROL MODULE (BCM)
DRIVETRAIN CONTROL MODULE (DTCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK THE VEHICLE CONFIGURATION

NOTE: The DTC must be active and no BUS communication DTCs present before performing this test. If BUS communication DTCs are present, perform there respective test first. If the DTC is stored, erase the DTC and cycle the ignition. If the DTC resets and changes to active, then proceed.

1. With the scan tool, check the vehicle configuration stored in the Body Control Module (BCM).

2. With the scan tool, check the vehicle configuration stored in the Drivetrain Control Module (DTCM).

Pick the answer that best describes your findings:

BCM has wrong or no vehicle configuration.

- With the scan tool, program the proper vehicle configuration in the BCM.
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

DTCM has wrong vehicle configuration but BCM has correct configuration.

- Replace the DTCM in accordance with the Service information. Refer to [MODULE, DRIVETRAIN CONTROL \(DTCM\), EMOVAL AND INSTALLATION](#) .
- Perform the DTCM VERIFICATION TEST. Refer to [DTCM VERIFICATION TEST](#) .

U0001-00-CAN C BUS

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [DIAGNOSIS AND TESTING](#) .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: Perform this diagnostic procedure **ONLY** when the DTC status is "Active". If the DTC status is "Stored" **DO NOT** proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0212-00-LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0401-00-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0402-00-INVALID DATA RECEIVED FROM TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0415-00-IMPLAUSIBLE DATA RECEIVED FROM ABS

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0429-00-IMPLAUSIBLE DATA RECEIVED FROM SCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - Verification Test - Gladiator

STANDARD PROCEDURE

DTCM VERIFICATION TEST

NOTE: The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

DIAGNOSTIC TEST

1. CHOOSE THE APPLICABLE TRACTION SYSTEM

1. Select the option below that is applicable to the system being worked on.

Does this vehicle have All Wheel Drive (AWD) or a Transfer Case

AWD

- Go To [2](#)

Transfer Case

- Go To [3](#)

2. AWD VERIFICATION TEST

NOTE: If the Drivetrain Control Module (DTCM), Powertrain Control Module (PCM), or Body Control Module (BCM) was replaced, refer to the Service Information for proper programming and alignment procedures.

1. Reinstall any removed components.
2. Reconnect any disconnected electrical connectors.
3. Ensure the battery is fully charged.
4. With the scan tool, erase DTCs.
5. Turn off all accessories.
6. Operate the vehicle under the conditions that originally set the DTC or caused the symptom.
7. Turn the ignition off, wait five seconds, then turn the ignition on.
8. With the scan tool, read DTCs.

Are any DTC(s) or symptoms present?

Yes

- Perform the related diagnostic procedure for the DTC(s) or symptom.

No

- Test complete.

3. TRANSFER CASE VERIFICATION TEST

NOTE: If the Drivetrain Control Module (DTCM), Powertrain Control Module (PCM), or Body Control Module (BCM) was replaced, refer to the Service

Information for proper programming and alignment procedures.

1. Reinstall any removed components.
2. Reconnect any disconnected electrical connectors.
3. Ensure the battery is fully charged.
4. With the scan tool, erase DTCs.
5. Turn off all accessories.
6. Test drive the vehicle. If equipped with a selector switch, drive the vehicle in each Transfer Case range and verify proper operation in each range.
 - To select or deselect 2WD, AWD or 4HI mode, vehicle speed must be below 88 Kmh (55 mph) with all wheels at vehicle speed.
 - Shifts will not take place with a wheel speed difference of greater than 21 Kmh (13 mph) between the front and rear wheels.
 - To select or deselect 4LO (if equipped), vehicle speed must be below 5 Kmh (3 mph) with the ignition on, engine not running and the transmission in neutral (automatic transmission) or the clutch pedal pressed (manual transmission).
 - To select or deselect Transfer Case Neutral (if equipped), vehicle speed must be 0 Kmh (0 mph) with the ignition on, engine not running, the brake pedal applied, and the transmission in neutral (automatic transmission) or the clutch pedal pressed (manual transmission). Press the Neutral button (if equipped) on the Transfer Case Selector Switch until the Neutral Indicator is illuminated.
 - If equipped with Axle Lockers, operate the axle lockers in accordance with the Owners Manual.

WARNING:

Apply the parking brake. The vehicle may roll with the Transfer Case in neutral.

- - To verify that the Transfer Case is in Neutral, shift the automatic transmission into reverse and release the brake pedal for three seconds or shift the manual transmission into gear and slowly release the clutch pedal.
7. With the scan tool, read DTCs in the Drivetrain Control Module (DTCM) and in the Instrument Panel Cluster (IPC).

Are any DTC(s) or symptoms present?

Yes

- Perform the related diagnostic procedure for the DTC(s) or symptom.

No

- Test complete.
-

2021 ACCESSORIES AND BODY, CAB

Drivetrain Control Module (DTCM) - Verification Test - Gladiator

STANDARD PROCEDURE

DTCM VERIFICATION TEST

NOTE: The DTCM learns the relative clutch position (Kisspoint) in order to adapt to normal wear of the clutch over its lifespan. If any clutch related components are replaced, the Kisspoint must be relearned by initiating a Non-Volatile Memory Reset (Clear T-Case Adaptives) with the scan tool.

DIAGNOSTIC TEST

1. CHOOSE THE APPLICABLE TRACTION SYSTEM

1. Select the option below that is applicable to the system being worked on.

Does this vehicle have All Wheel Drive (AWD) or a Transfer Case

AWD

- Go To [2](#)

Transfer Case

- Go To [3](#)

2. AWD VERIFICATION TEST

NOTE: If the Drivetrain Control Module (DTCM), Powertrain Control Module (PCM), or Body Control Module (BCM) was replaced, refer to the Service Information for proper programming and alignment procedures.

1. Reinstall any removed components.
2. Reconnect any disconnected electrical connectors.
3. Ensure the battery is fully charged.
4. With the scan tool, erase DTCs.
5. Turn off all accessories.
6. Operate the vehicle under the conditions that originally set the DTC or caused the symptom.
7. Turn the ignition off, wait five seconds, then turn the ignition on.
8. With the scan tool, read DTCs.

Are any DTC(s) or symptoms present?

Yes

- Perform the related diagnostic procedure for the DTC(s) or symptom.

No

- Test complete.

3. TRANSFER CASE VERIFICATION TEST

NOTE: If the Drivetrain Control Module (DTCM), Powertrain Control Module (PCM), or Body Control Module (BCM) was replaced, refer to the Service

Information for proper programming and alignment procedures.

1. Reinstall any removed components.
2. Reconnect any disconnected electrical connectors.
3. Ensure the battery is fully charged.
4. With the scan tool, erase DTCs.
5. Turn off all accessories.
6. Test drive the vehicle. If equipped with a selector switch, drive the vehicle in each Transfer Case range and verify proper operation in each range.
 - To select or deselect 2WD, AWD or 4HI mode, vehicle speed must be below 88 Kmh (55 mph) with all wheels at vehicle speed.
 - Shifts will not take place with a wheel speed difference of greater than 21 Kmh (13 mph) between the front and rear wheels.
 - To select or deselect 4LO (if equipped), vehicle speed must be below 5 Kmh (3 mph) with the ignition on, engine not running and the transmission in neutral (automatic transmission) or the clutch pedal pressed (manual transmission).
 - To select or deselect Transfer Case Neutral (if equipped), vehicle speed must be 0 Kmh (0 mph) with the ignition on, engine not running, the brake pedal applied, and the transmission in neutral (automatic transmission) or the clutch pedal pressed (manual transmission). Press the Neutral button (if equipped) on the Transfer Case Selector Switch until the Neutral Indicator is illuminated.
 - If equipped with Axle Lockers, operate the axle lockers in accordance with the Owners Manual.

WARNING:

Apply the parking brake. The vehicle may roll with the Transfer Case in neutral.

- - To verify that the Transfer Case is in Neutral, shift the automatic transmission into reverse and release the brake pedal for three seconds or shift the manual transmission into gear and slowly release the clutch pedal.
7. With the scan tool, read DTCs in the Drivetrain Control Module (DTCM) and in the Instrument Panel Cluster (IPC).

Are any DTC(s) or symptoms present?

Yes

- Perform the related diagnostic procedure for the DTC(s) or symptom.

No

- Test complete.
-

2021 ACCESSORIES AND BODY, CAB

Electronic Control Modules (Service Information) - Gladiator

STANDARD PROCEDURE

IMMOBILIZER COMPONENTS AND REPLACEMENT GUIDE

Component:
Body Control Module (BCM)
Radio Frequency Hub (RFH) Module
Powertrain Control Module (PCM)
Electronic Steering Lock (ESL) Module
Electronic Control Unit (ECU)

Example Scenario: If a user has replaced both the PCM and BCM, the table indicates the routines should be ran in the following order:

1. BCM Immobilizer Replace
2. Immobilizer ECUs Replaced
3. ECU Specific Procedures

All procedure names in the table are how they will appear in the diagnostic scan tool.

Priority	Procedure Name	BCM	PCM	ESL	FOBIKs	RFH
1	Vehicle Reconfiguration	X	B	B	B	B
2	RF-Hub Replace	B	B	B	B	X
3	Program Ignition FOBIKs	B	B	B	X	B
4	BCM Immobilizer Replace	X	B	B	B	B
5	Immobilizer ECUs Replaced	B	X	X	B	B
6	ECU Specific Procedures	X	X	X	B	X

NOTE: If the BCM does not program, please disconnect the battery, wait 15 seconds, reconnect the battery and run the BCM immobilizer replace routine again.

TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

MODULES AND ACCESSORIES

DESCRIPTION	SPECIFICATION	COMMENT
Amplifier to Body	5 N.m (44 In. Lbs.)	-
BCM to Body	5 N.m (44 In. Lbs.)	-
Central Vision Processing Module (CVPM) to Body Bolts	5 N.m (44 In. Lbs.)	-
DTCM Bracket Mounting Nuts	9 N.m (82 In. Lbs.)	-
EPB Nut	6 N.m (53 In. Lbs.)	-
ORC Module	11 N.m (8 Ft. Lbs.)	-
PARK ASSIST MODULE TO BIW	3 N.m (26 In. Lbs.)	-
PCM to Bracket Bolts	8 N.m (71 In. Lbs.)	-
PCM to Bracket Nuts	8 N.m (71 In. Lbs.)	-
PCM Bracket to Body Bolts	6 N.m (53 In. Lbs.)	-

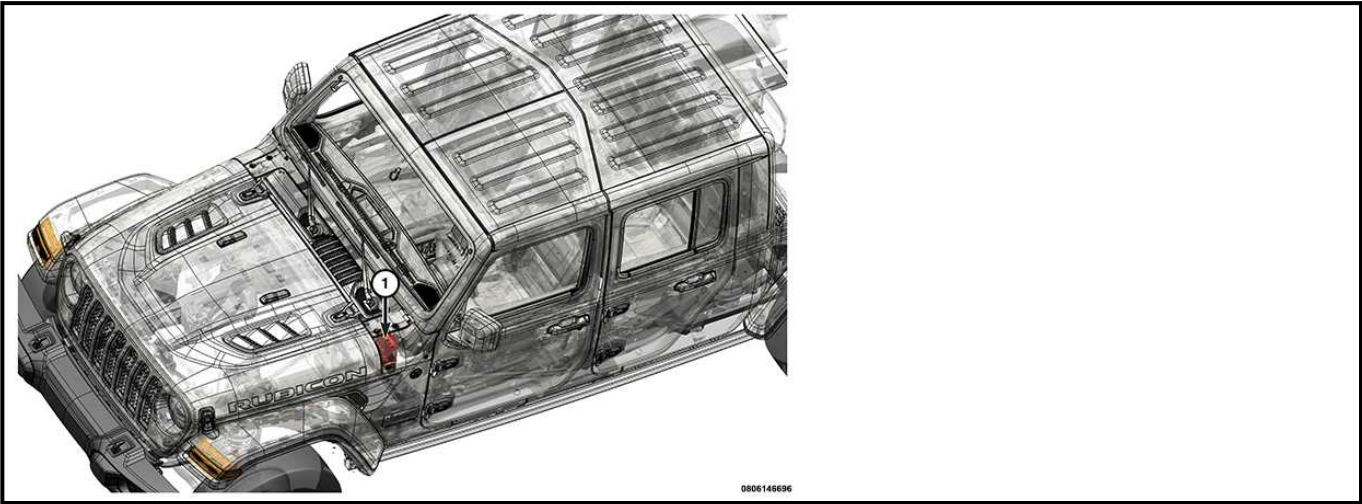
DESCRIPTION	SPECIFICATION	COMMENT
PCM Ground Wire Install	7 N.m (62 In. Lbs.)	-
PCM Ground Wire Nuts	9 N.m (82 In. Lbs.)	-
PDC to Wiring Connector	5 N.m (44 In. Lbs.)	-
PDC LOWER COVER Nuts	8 N.m (71 In. Lbs.)	-
Power Inverter Module Bracket to IP	8 N.m (71 In. Lbs.)	-
RFH Module to bracket	9 N.m (82 In. Lbs.)	-
Security Gateway Module to Speaker Enclosure	5 N.m (44 In. Lbs.)	-
Steering Column Control Module Band Clamp Screw	6 N.m (53 In. Lbs.)	-
Tire Pressure Monitoring (TPM) Module Bracket Nuts	7 N.m (62 In. Lbs.)	-

AMPLIFIER (AMP)

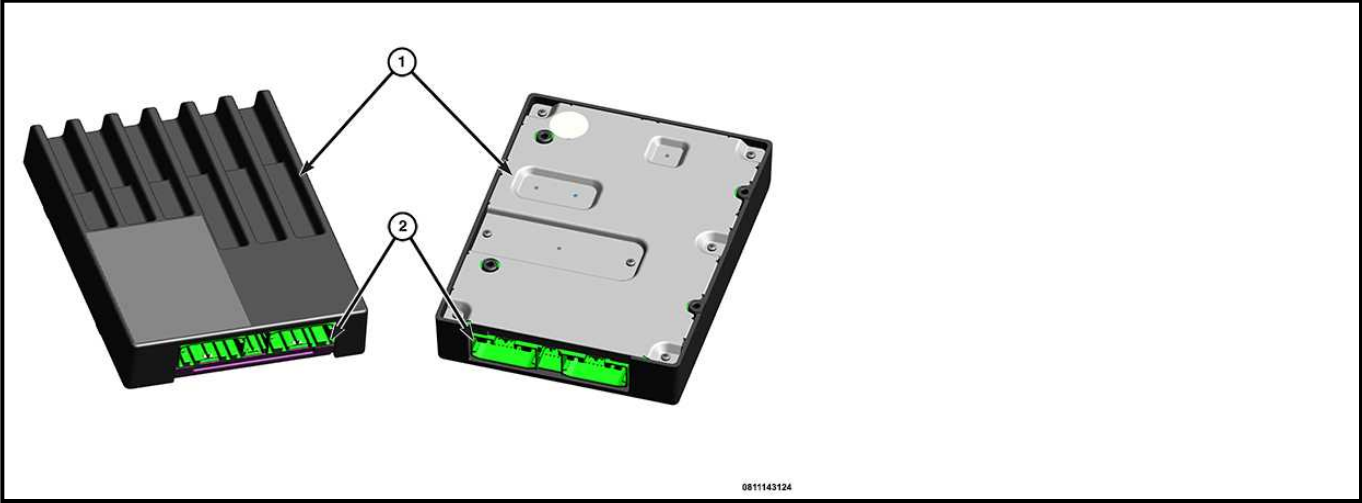
DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



There are two optional 12 channel amplifiers available. Both amplifiers are located in the same location (1) for either sound system; forward of the left front speaker enclosure. Both amplifiers look similar and can be identified by the part number or sales code.



The amplifier (1) has three electrical connector receptacles (2) on one end that connect it to the instrument panel wire harness connectors.

OPERATION

The audio power amplifier receives fused B+ current from a fuse in the Power Distribution Center (PDC) and is grounded through a circuit of the body wire harness that is secured to the body sheet metal at all times. The internal circuitry of the amplifier switches the amplifier ON or OFF based upon electronic messages that are received over the Controller Area Network - Interior High Speed (CAN-IHS) data bus from the Body Control Module (BCM) whenever the ignition switch status is ON.

The amplifier receives analog sound signal inputs from the front and rear, left and right outputs of the radio, then provides the amplified speaker outputs for each of those channels to the appropriate speakers through dedicated audio output circuits. The amplifier also receives electronic messages from the BCM and the radio over the CAN-IHS data bus that communicate the correct channel settings for optimum speaker sound and output.

Hardwire Inputs

- Radio audio data
- Information 1 audio data
- Information 2 audio data

Hardwire Outputs

- Subwoofer output data
- Speaker output data

CAN-IHS Inputs

- Ignition switch status
- System voltage
- Vehicle speed
- Audio source, type and level controls
- Audio mode for cabin/driver
- Audio mute status
- Park assist chime type/request/rate and volume
- Blind Spot Module (BSM) chime type/request
- Forward Collision Warning (FCW) chime type/request/rate
- Vehicle configuration and status
- Radio configuration and status
- CAN configuration and status
- Removable hard top ON/OFF status from BCM

CAN-IHS Outputs

- Driver select surround status to radio
- Amplifier stored equalization curve to radio
- Surround sound available for selected cabin mode to radio

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AUDIO AMPLIFIER

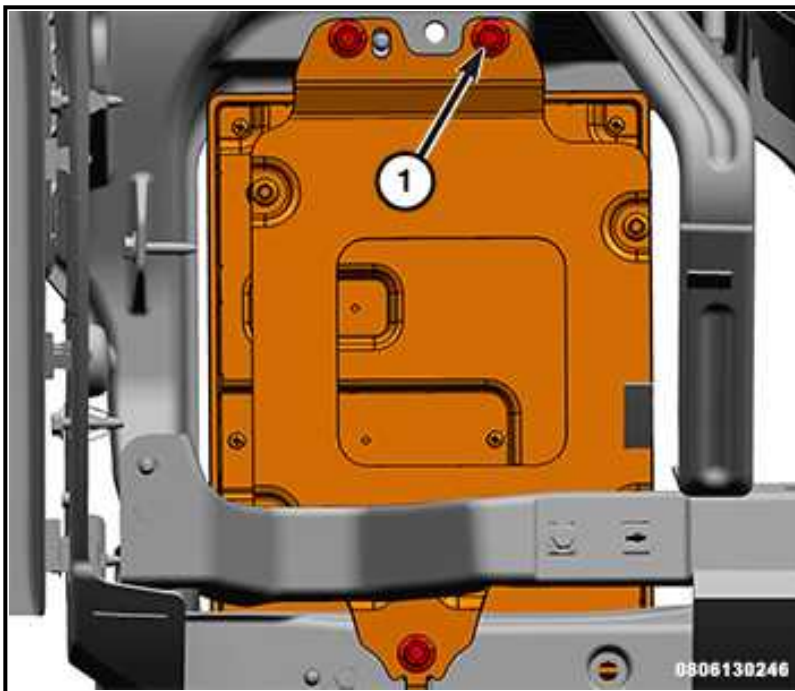
WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

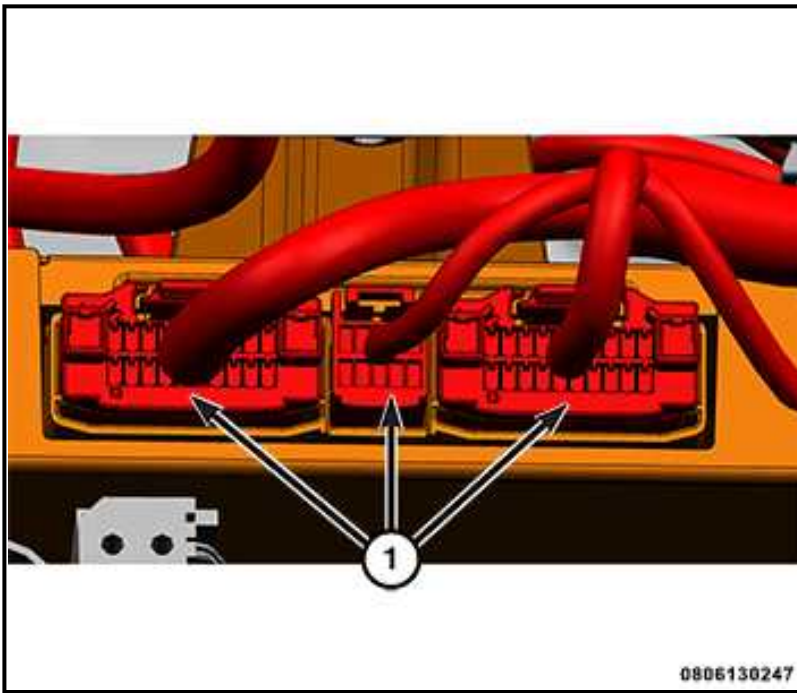
The audio amplifier should be checked if there is no sound output noted from the speakers. Refer to **SPEAKER, DIAGNOSIS AND TESTING** .

The hardwired circuits between components related to the radio and the audio amplifier may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to **STANDARD PROCEDURE** . and. Refer to **REMOVAL** . Refer to **INSTALLATION** .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the amplifier or the electronic controls and communication between modules and other devices that provide some features of the audio system. The most reliable, efficient and accurate means to diagnose the amplifier or the electronic controls and communication related to audio system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL AND INSTALLATION**REMOVAL AND INSTALLATION****REMOVAL**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the driver side speaker enclosure. Refer to **ENCLOSURE, SPEAKER, REMOVAL AND INSTALLATION** .
3. Remove the (1) amplifier mounting fasteners.



4. Disconnect the amplifier wire harness connectors (1) and remove the amplifier.

INSTALLATION

1. Connect the amplifier wire harness connectors.
2. Install the amplifier mounting fasteners and tighten securely.
3. Install the driver side speaker enclosure. Refer to [ENCLOSURE, SPEAKER, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

COMMUNICATION

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION

This vehicle is equipped with the Powernet electronic architecture.

The primary on-board communication network between Electronic Control Units (ECU) in this vehicle is the Controller Area Network (CAN) data bus system. A data bus network minimizes redundant wiring connections; and, at the same time, reduces wire harness complexity, sensor current loads and controller hardware by allowing each sensing device to be connected to only one module (also referred to as a node). Each node reads, then broadcasts its sensor data over the bus for use by all other nodes requiring that data. Each node ignores the messages on the bus that it cannot use. These networks are protected by a Security Gateway Module (SGW).

The CAN bus is a two-wire multiplex system. Multiplexing is any system that enables the transmission of multiple messages over a single channel or circuit. The CAN bus is used for communication between most vehicle nodes. However, in addition to the CAN bus network, certain nodes may also be equipped with a Local Interface Network (LIN) data bus. The LIN data bus is a single wire low-speed (9.6 Kbps) serial link bus used to provide direct communication between a LIN master module and certain switch or sensor inputs.

There are actually two separate CAN bus systems used in the vehicle. They are designated: the CAN-Chassis (CAN-C) and the CAN-Interior High Speed (IHS). The CAN-C and CAN-IHS systems provide on-board communication between all of the nodes that are connected to them. The CAN-C is the faster of the two systems providing near real-time communication (500 Kbps). The CAN-C is used typically for communications

between more critical nodes, while the slower (125 Kbps). The CAN-IHS system is used for communications between less critical nodes.

- CAN-Chassis (CAN-C)
 - For a complete CAN C BUS LAYOUT wiring diagram, **Refer to the appropriate wiring information .**
 - For a complete CAN C BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**
- CAN-Interior High Speed (CAN-IHS)
 - For a complete CAN IHS BUS LAYOUT wiring diagram, **Refer to the appropriate wiring information .**
 - For a complete CAN IHS BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

The added speed of the CAN data bus is many times faster than previous data bus systems. This added speed facilitates the addition of more electronic control modules or nodes and the incorporation of many new electrical and electronic features in the vehicle.

The Body Control Module (BCM) is located under the instrument panel to right of the glove box. The central CAN gateway or hub module integral to the BCM is connected to CAN-C and CAN-IHS buses. This gateway physically and electrically isolates the CAN buses from each other and coordinates the bi-directional transfer of messages between them.

All modules transmit and receive messages over one of these buses. Data exchange between the modules is achieved by serial transmission of encoded data messages (a form of transmission in which data bits are sent sequentially, one at a time, over a single line). Each module can both send and receive serial data simultaneously. Each data bit of a CAN bus message is carried over the bus as a voltage differential between the two bus circuits which, when strung together, form a message. Each module uses arbitration to sort the message priority if two competing messages are attempting to be broadcast at the same time. Corruption of a single bit within a message will corrupt the entire message. Each message contains a Cyclic Redundancy Check (CRC) which specifies the message size exactly. If the message detected conflicts with the CRC the ECU receiving it will determine the message to be an error and consider that communication has not been possible. Diagnosis of this condition using a lab scope may reveal activity that appears to be Bus data messages even if no actual communication is possible. Communication problems that affect the whole bus, as a result of opens and terminal push outs are more likely to occur on data busses that operate at a high speed than a data bus that operates at a lower speed

LIN

In addition to the CAN bus network, certain ECUs may also be equipped with a Local Interface Network (LIN) data bus. The LIN data bus is a single wire low-speed (9.6 Kbps) serial link bus used to provide direct communication between a LIN master module and certain switch or sensor inputs based on vehicle configuration. There is also a private security bus network between the Radio Frequency Hub (RFH) Module and the Keyless Ignition Node (KIN) known as the Security K Line Communication Bus.

NOTE: **Below are some of the LINs available on this vehicle depending upon vehicle configuration.**

LIN BUS MODULE APPLICATION TABLE

Local Interconnect Network (LIN)				
Master Module	CIRCUIT ID	Slave Module		
Body Control Module (BCM) LIN 1	D401	Off Road Bank Switch	Upper Switch Bank	Intelligent Battery Sensor

Local Interconnect Network (LIN)				
Master Module	CIRCUIT ID	Slave Module		
Body Control Module (BCM) LIN 2	D402	Electronic Overhead Module	Inside Rear View Mirror	Compass Module
Body Control Module (BCM) LIN 3	D403	Steering Column Control Module	Inverter Module	
Steering Column Control Module (SCCM)	D592	Speed Control Switch		
	D594	Left Steering Wheel Switch		

For a complete LIN BUS SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

OPERATION

The Controller Area Network (CAN) data bus allows all electronic modules connected to the bus to share information with each other. Regardless of whether a message originates from a module on the higher speed CAN-C (500K) bus or on the lower speed CAN-IHS (125K) Bus the message structure and layout is similar, which allows the BCM to be a Central Gateway to process and transfer messages between the CAN-C and CAN-IHS buses. The BCM also stores Diagnostic Trouble Codes (DTCs) for bus networking faults.

The vehicle communication systems may be diagnosed with the Mopar Scope. Refer to **DIAGNOSIS AND TESTING** .

CAN BUS FAULTS

TYPES OF CAN BUS FAULTS	
LOSS OF COMMUNICATION	will set by an active receiving/reporting ECU on a CAN Bus network that detects no communication from another ECU on the same CAN Bus network. Insufficient power, ground, bus voltage, or inaccurate vehicle configuration will cause a loss of communication.
IMPLAUSIBLE MESSAGE	will set by an active receiving/reporting ECU, when it determines the data sent from the active transmitting/offending ECU is missing part of the message, or the message is an irrational value over the CAN Bus.
MISSING MESSAGE	will set by an active receiving/reporting ECU, when it determines a data message to be missing partial information when sent from the active transmitting/offending ECU over the CAN Bus network.
BUS OFF	set by an ECU that has experienced approximately 32 transmit errors, this can be caused by ECU internal faults as well as external bus faults like shorts or plugging and unplugging test tools to the diagnostic connector.
PHYSICAL	is only detectable by an ECU that has a transceiver that is able to detect shorts on the bus. If the ECU does not, it generally will set bus off faults due to shorted bus lines.

The CAN bus nodes are connected in parallel to the two-wire bus using a twisted pair, where the wires are wrapped around each other to provide shielding from unwanted electromagnetic induction, thus preventing interference with the relatively low voltage signals being carried through them. The twisted pairs have between 33 and 50 twists per meter (yard). While the CAN bus is operating (active), one of the bus wires will carry a higher voltage and is referred to as the CAN High or CAN bus (+) wire, while the other bus wire will carry a lower voltage and is referred to as the CAN Low or CAN bus (-) wire. Refer to the CAN Bus Voltages table.

CAN Bus Operational Voltages								
CAN-C Bus Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN-L Short to Ground	CAN-H Short to Ground	CAN-L Short to Battery	CAN-H Short to Battery	CAN-H Short to CAN-L
CAN-L (-)	0 V	2.3 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0 V	2.5 - 2.7 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V
CAN-IHS Bus Circuits	Key-Off (Bus Asleep)		Key-On (Bus Active)	CAN-L Short to Ground	CAN-H Short to Ground	CAN-L Short to Battery	CAN-H Short to Battery	CAN-H Short to CAN-L
CAN-L (-)	0.0V		1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0.0 V		2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V
Notes								
All measurements taken between node ground and CAN terminal with a standard DVOM. Digital Voltmeter (DVOM) will display average network voltage. Total resistance of CAN networks can be measured with the battery disconnected. The average resistance is approximately 60 Ohms. The termination resistors are integral to the Star Connectors.								

The CAN-IHS bus network remains active until all nodes on that network are ready for sleep. This is determined by the network using tokens in a manner similar to polling. When the last node that is active on the network is ready for sleep, and it has already received a token indicating that all other nodes on the bus are ready for sleep, it broadcasts a **bus sleep acknowledgment** message that causes the network to sleep. Once the CAN-IHS bus network is asleep, any node on the bus can awaken it by transmitting a message on the network.

In the CAN system, available options are configured into the BCM at the assembly plant, but additional options can be added in the field using the diagnostic scan tool. The configuration settings are stored in non-volatile memory.

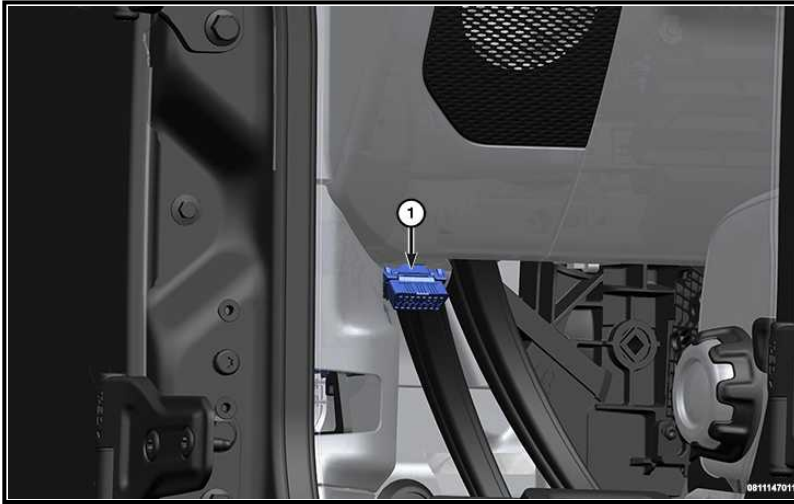
The BCM stores a Diagnostic Trouble Code (DTC) in one of two caches for any detected active or stored faults in the order in which they occur. One cache stores powertrain (P-Code), chassis (C-Code) and body (B-Code) DTCs, while the second cache is dedicated to storing network (U-Code) DTCs.

CONNECTOR, DATA LINK (DLC)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



DLC (1) - Is a 16-way molded plastic connector insulator on a dedicated take out of the instrument panel wire harness. This connector is located at the lower edge of the instrument panel, outboard of the steering column. The connector insulator is retained by integral snap features within a rectangular cutout in a mounting bracket located just under the lower edge of the instrument panel, directly above the hood release.

OPERATION

The central diagnostic socket receives a direct battery power supply from the line protected by a fuse located in the Body Control Module (BCM). The BCM receives a direct power supply from the battery through the line protected by maxi fuse in the engine compartment junction unit. The BCM receives an ignition-operated power supply. This signal is used, among other things, to "wake up the network".

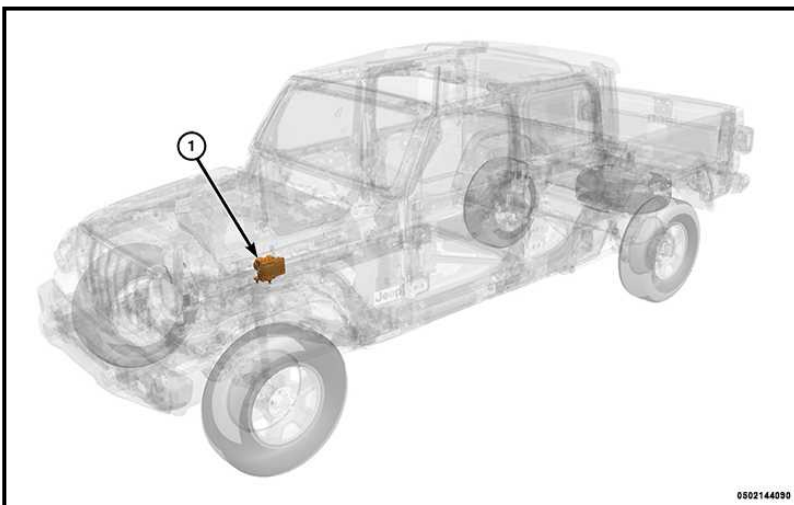
The DLC connection to the vehicle is protected by the Security Gateway Module (SGW) authentication requirements.

MODULE, ANTI-LOCK BRAKE SYSTEM (ABS)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



1. Antilock Brake System (ABS) Module

NOTE: The Electronic Stability Control (ESC) may also be referred to as Electronic Stability Program (ESP) depending on the vehicle model year and

configuration. Certain components may also reference ESP, ESC, or use the traction control symbol.

OPERATION

The ABS module (1) is mounted to the Hydraulic Control Unit (HCU) together forming the Integrated Control Unit (ICU). The ABS module is a micro-controller based device which monitors the antilock brake system during normal braking and controls it when the vehicle is in an ABS stop. The ABS function avoids wheels lock during braking maneuvers, maintaining the directionality of the vehicle, and optimizing the reproducibility of stop distance.

The primary functions of the ABS are to:

- Monitor the antilock brake system for proper operation.
- Detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.
- Control fluid modulation to the wheel brakes while the system is in an ABS mode.
- Store diagnostic information.
- Provide communication to the scan tool while in diagnostic mode.
- Illuminate the ABS, ESC, or BRAKE warning indicator lamp when the system is faulted.
- Illuminate the ESC function lamp when a vehicle dynamic event is occurring.
- Provide vehicle speed information, by monitoring the wheel speed sensors, to all modules on the Controller Area Network-Chassis (CAN-C) bus.

The ABS module constantly monitors the antilock brake system for proper operation. If the ABS module detects a fault, it will disable the ABS system and will command the Instrument Panel Cluster (IPC) to illuminate the amber ABS warning indicator lamp. The normal base braking system will remain operational.

NOTE: **If the vehicle is equipped with traction control, the ESC function lamp will illuminate anytime the amber ABS warning indicator lamp illuminates.**

The ABS module continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the ABS module commands the solenoid coils to actuate. The solenoid coils then open and close the valves in the HCU that modulate brake fluid pressure in some or all of the hydraulic circuits. The ABS module continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present. The ABS module contains a self-diagnostic program that monitors the antilock brake system for system faults. When a fault is detected, a warning indicator lamp is turned on and the fault Diagnostic Trouble Code (DTC) is then stored in a diagnostic program memory. A latched fault will disable certain system functionality for the current ignition cycle. An unlatched fault will disable certain system functionality until the fault condition disappears. These DTCs will remain in the ABS module memory even after the ignition has been turned off. The DTCs can be read and cleared from the ABS module memory by a technician using a scan tool. If not cleared with a scan tool, the fault occurrence and DTC will be automatically cleared from the ABS module memory after the identical fault has not been seen during the next 100 ignition cycles.

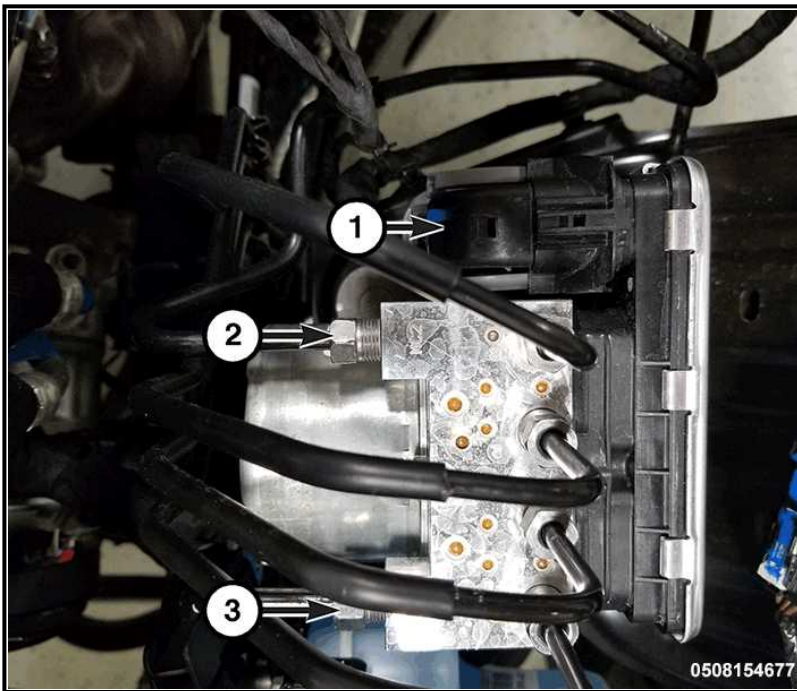
The ABS module controls the ABS system, Cornering Brake Control (CBC), Motor Schleppmoment Regelung (MSR) (also known as the Drag Torque Control Motor), and Off-Road ABS (ORA) ESC functions. The ESC tries to avoid locking of the wheels for ABS, reduces oversteer tendency for CBC, tries to avoid locking of the drive axle for MSR, and optimally decelerate off-road for ORA.

REMOVAL AND INSTALLATION

ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

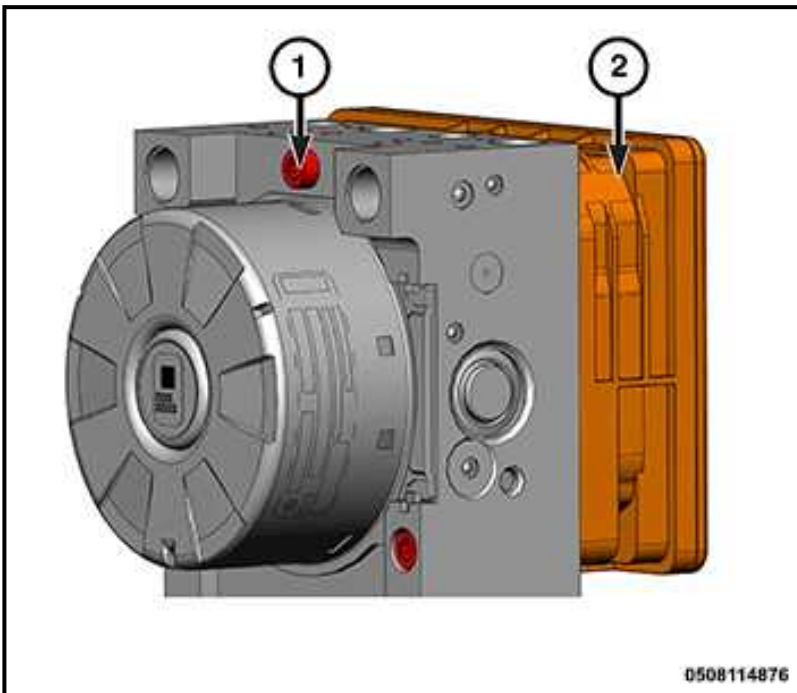
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



1 - Wire Harness Connector
2 - Brake Line Flare Nut
3 - Brake Line Flare Nut

2. Disconnect the Anti-lock Brake System (ABS) module wire harness connector.



1 - Anti-lock Brake System (ABS) Module Bolts
2 - ABS Module

3. Remove the ABS module fasteners.
4. Remove the ABS module from the Hydraulic Control Unit (HCU).

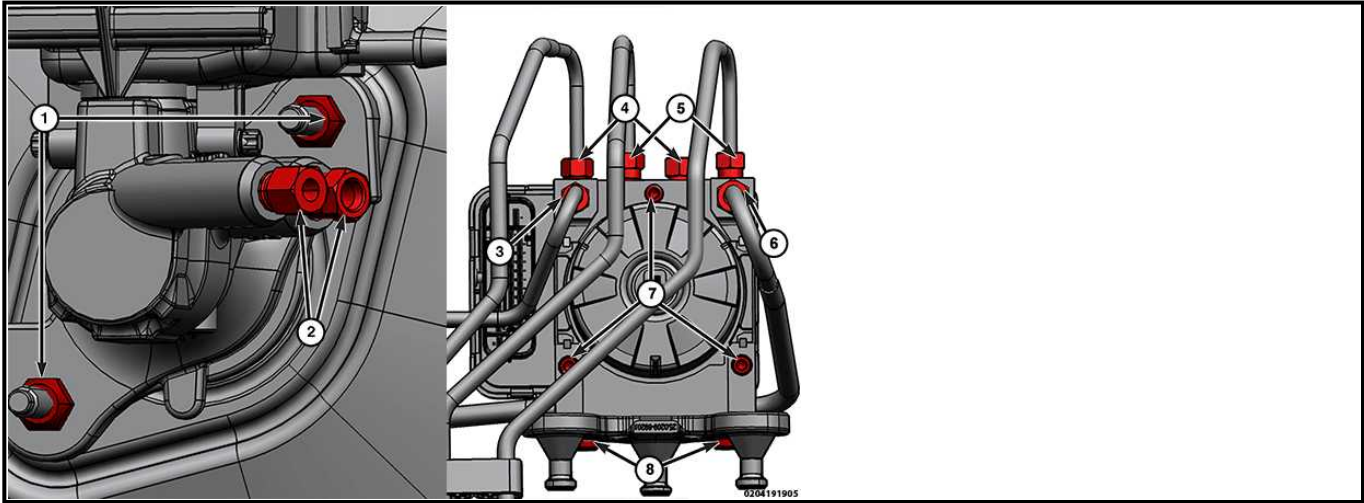
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

BRAKE BOOSTER AND MODULE



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Master Cylinder Nuts	18 N. m (13 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
2	Master Cylinder Brake Lines	23 N. m (17 Ft. Lbs.)	-
3	Primary Brake Line Flare Nut at Hydraulic Control Unit (HCU)	25 N. m (18 Ft. Lbs.)	-
4	Hydraulic Control Unit (HCU) Brake Line Flare Nuts	20 N. m (15 Ft. Lbs.)	-
5	Hydraulic Control Unit (HCU) Brake Line Flare Nuts	20 N. m (15 Ft. Lbs.)	-
6	Secondary Brake Line Flare Nut at Hydraulic Control Unit (HCU)	23 N. m (17 Ft. Lbs.)	-
7	Brake System Control Module (BSCM) Bolts	8 N. m (70 In. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
8	Hydraulic Control Unit (HCU) Bracket Bolts	5 N.m (44 In. Lbs.)	-

MODULE PROGRAMMING

DIAGNOSTIC TEST

Anti-lock Brake System (ABS) VERIFICATION TEST

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

1. Connect all previously disconnected components and connectors.
2. If any of the following components were replaced, use the following table below and perform the correct routines using the scan tool under "Miscellaneous Functions":

NOTE: When performing the ABS Initialization routine, the vehicle temperature must be above 10B°C (50B°F).

NOTE: If the ABS is not initialized, the ABS indicator will flash continuously.

Component	Routines
Anti-lock Brake System (ABS) Module	ABS Initialization/Brake Pedal Calibration
Hydraulic Control Unit (HCU)	ABS Initialization/ABS Bleed Brakes/Brake Pedal Calibration
Integrated Control Unit (ICU)	ABS Initialization/ABS Bleed Brakes/Brake Pedal Calibration
Brake Pedal Sensor	Brake Pedal Calibration
Dynamics Sensor	ABS Initialization
Steering Column Control Module (SCCM)/Steering Angle Sensor (SAS)	ABS Initialization

NOTE: If any of the Wheel Speed Sensors were replaced, test drive the vehicle at a speed above 25 km/h (15 mph) for several minutes.

NOTE: If the ABS Module or the Dynamic Sensor was replaced, there may be a Dynamic Sensor DTC active. To initialize the ABS Module and clear offsets have the vehicle on level ground and wheels pointing straight ahead and follow the directions on the scan tool. If the Dynamics Sensor was replaced, test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/h (6 and 15 mph).

3. Turn the ignition off.
4. Verify all accessories are turned off and the battery is fully charged.
5. Turn the ignition on.
6. With the scan tool, erase all Diagnostic Trouble Codes (DTCs) from All modules. Start the engine and allow it to run for two minutes and fully operate the system that was indicating the failure.
7. Cycle the ignition off and to ignition on.
8. With the scan tool, read DTCs in the ABS Module.
9. If any DTCs are present, perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

NOTE: For Sensor Signal Plausibility and Pump Motor faults, the ABS Module must verify that the failure conditions are no longer present in the current ignition cycle before it can turn off the failure lamp(s). This may require the vehicle to be driven for several minutes above 15 k/mh (9 mph). Once it has been determined that the failure condition is no longer present the lamp(s) will be turned off.

10. If there are no DTCs present after turning ignition on, road test the vehicle for at least five minutes.
 - Slowly turn the steering wheel from stop to stop.
 - Test drive the vehicle by turning the vehicle left or right in a curving manner at a speeds between 10 and 25 km/h (6 and 15 mph).
 - Perform several anti-lock braking stops.

11. Again, with the scan tool read DTCs. If any DTCs are present, for the diagnostic procedure and troubleshoot the new or recurring DTC. Refer to **DIAGNOSIS AND TESTING** .
12. If there are no Diagnostic Trouble Codes (DTCs) present, and the customer's concern can no longer be duplicated, the repair is complete.

Are any DTCs present or is the original concern still present?

Yes

- Repair is not complete, perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING** .

No

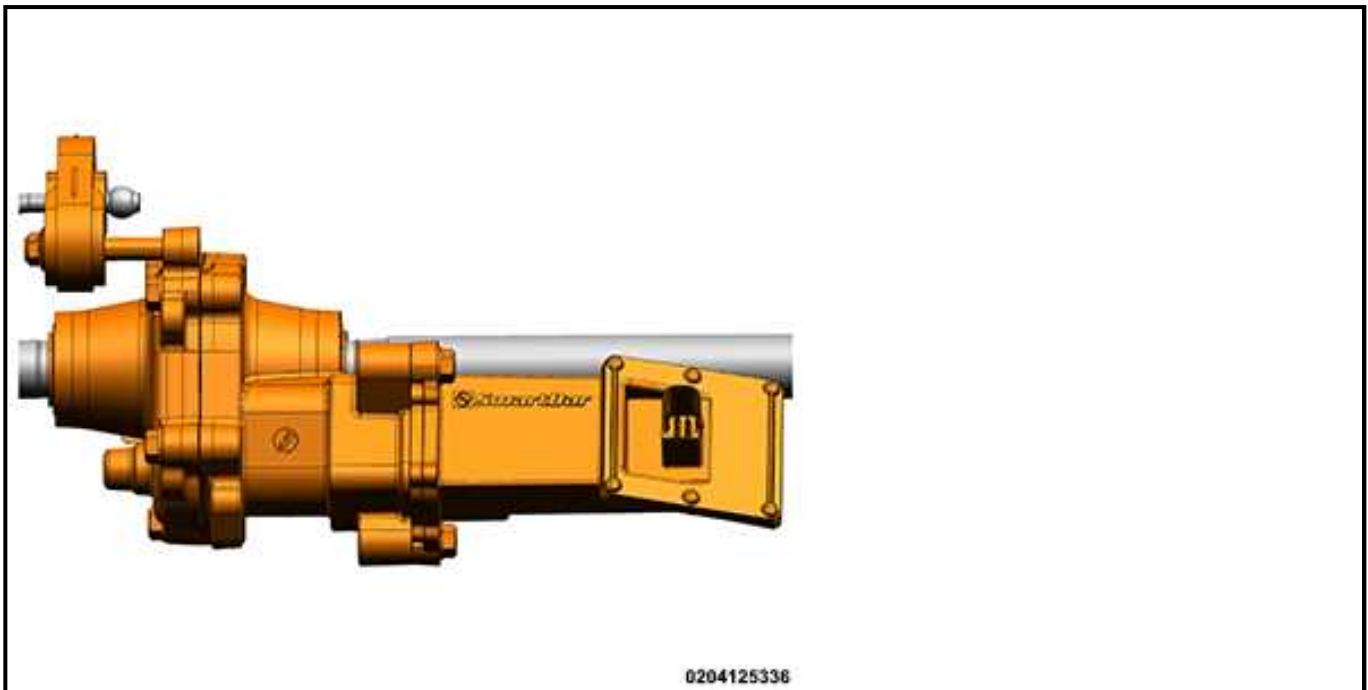
- Repair is complete.

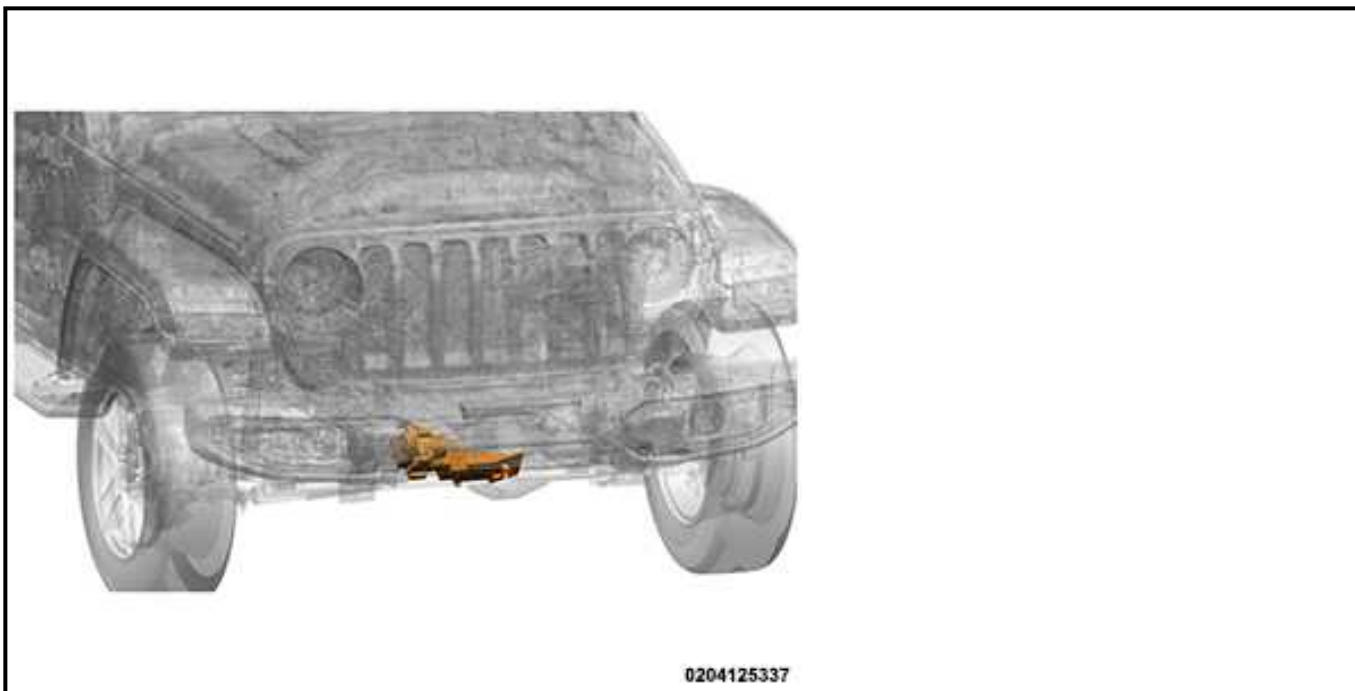
MODULE, ACTIVE SWAY BAR SYSTEM (ASBS)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION





The actuator is a motor driven unit that engages and disengages the disconnecting stabilizer bar.

The Active Sway Bar System (ASBS) switch is integral to the Auxiliary Switch Bank Module (ASBM) which communicates over Local Interface Network (LIN) to the Body Control Module (BCM). The Body Controller simply gates the switch request to the ASBS module and the Light Emitting Diode (LED) request from the ASBS to the ASBM. There is no functionality in the BCM.

When the stabilizer bar is disengaged/unlocked the LED in the switch will be SOLID. The LED will be OFF when the stabilizer bar is engaged/locked and will not automatically re-disengage without a customer request (switch actuation).

The LED on the switch will flash for the following reasons:

- When the stabilizer bar disconnect or connect is "In Progress" or
- The vehicle speed threshold has been exceeded with stabilizer bar disconnected (when transfer case is 4LO or 4HI)
- The stabilizer bar was previously disconnected (in 4LO/4HI transfer case) and re-connected because transfer case was changed to N

The ASBS module provides status messages which are displayed in the Instrument Panel Cluster (IPC).

The ASBS module receives a switched ignition feed from the RUN/START Relay and a constant B+ feed from the Power Distribution Center (PDC) to the module.

The ASBS module communicates over Controller Area Network (CAN)-C bus.

REMOVAL AND INSTALLATION

ACTIVE STABILIZER BAR SYSTEM (ASBS) MODULE

NOTE: If the Active Sway Bar System (ASBS) module requires replacement, the stabilizer bar must be replaced.

For removal and installation of the ASBS module. Refer to **STABILIZER BAR, FRONT, REMOVAL AND INSTALLATION** .

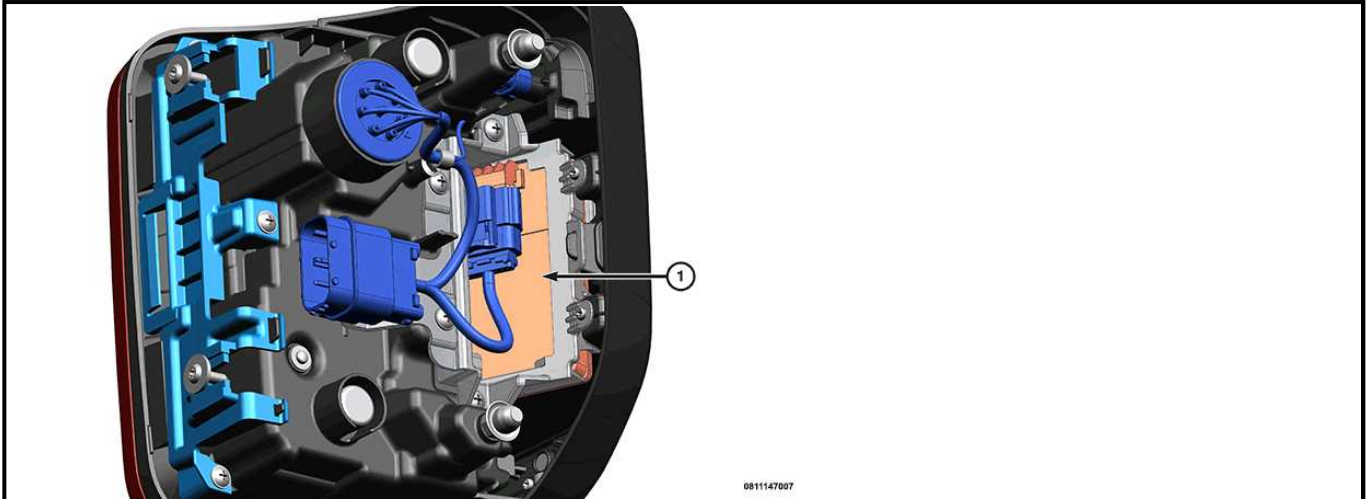
MODULE, BLIND SPOT (BSM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION



The optional Blind Spot Monitor (BSM) system used in this vehicle has two control modules. Each BSM is integral to the Left Blind Spot Sensor (LBSS) (1) or Right Blind Spot Sensor (RBSS) for the same side of the vehicle.



The serviceable BSM (1) is integral to the rear combined lamp unit; one on each side of the vehicle. For operation of the BSM system, please. Refer to [DESCRIPTION AND OPERATION](#) .

REMOVAL AND INSTALLATION

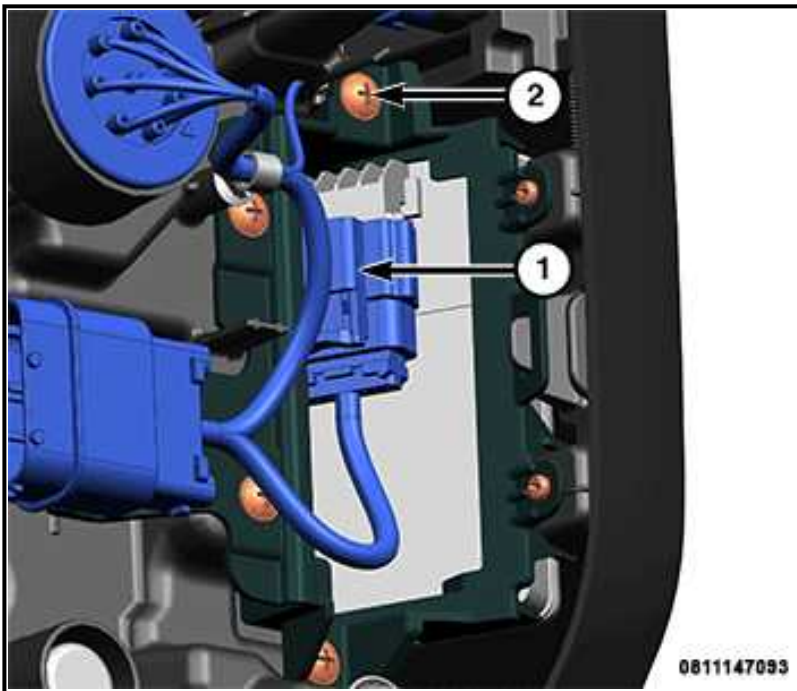
REMOVAL AND INSTALLATION

NOTE:

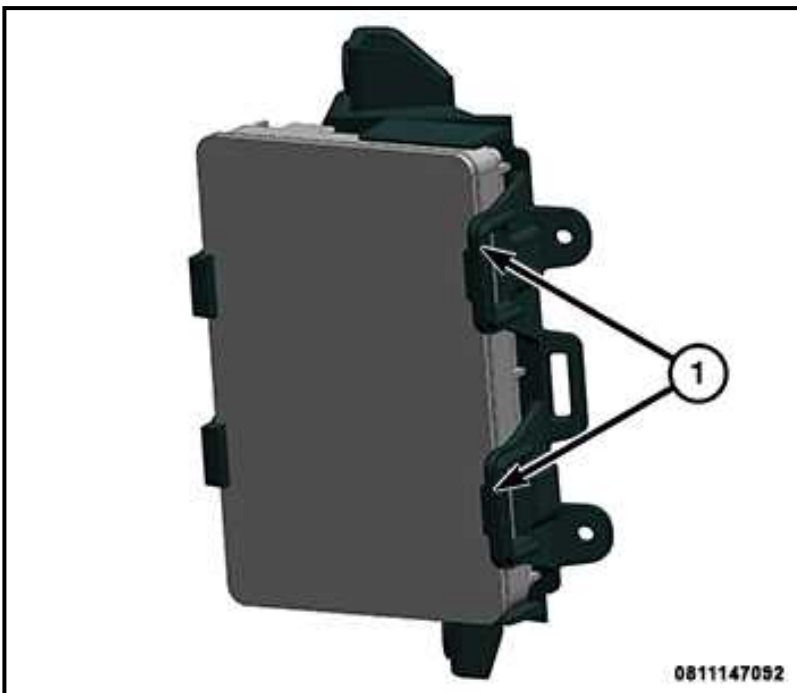
The optional Blind Spot Monitor (BSM) system used in this vehicle has two control modules, each internal to the sensor mounted on the inside of the tail lamp assembly. The Right Blind Spot Sensor (RBSS) is mounted to the backside of the right tail lamp assembly and can be serviced separately from the lamp assembly. The Left Blind Spot Sensor (LBSS) is mounted to the backside of the left tail lamp assembly and can be serviced separately from the lamp assembly.

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the appropriate rear tail lamp. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .



3. Disengage the tail lamp wire harness connector (1) from the BSM.
4. Remove six BSM bracket to tail lamp housing screws (2) and remove the bracket with the BSM from the tail lamp housing.



5. Disengage the BSM retainers (1) and remove the BSM from the BSM bracket.

INSTALLATION

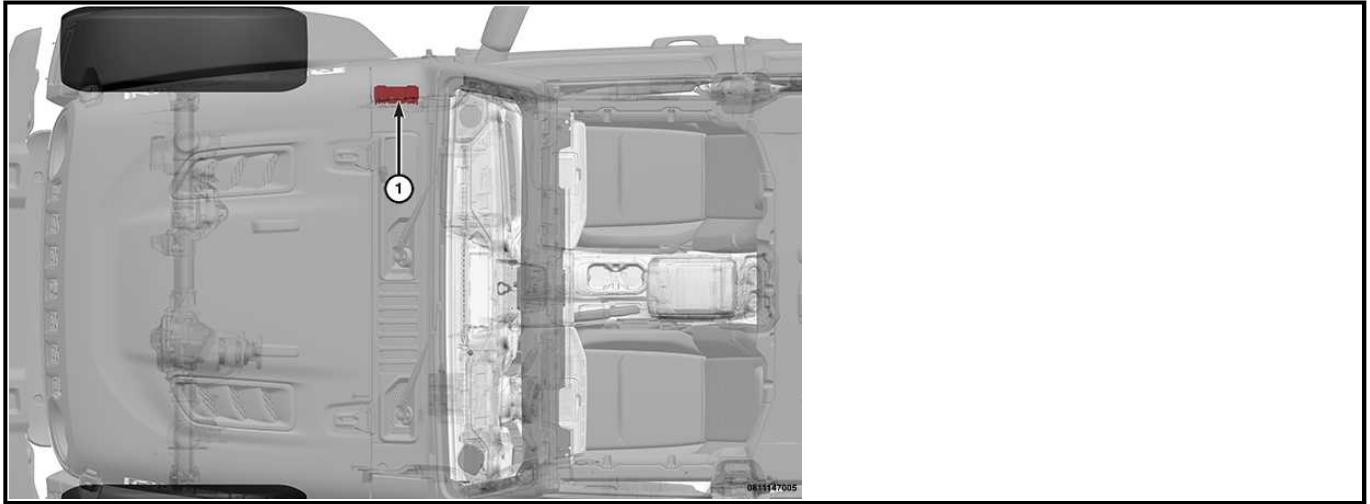
1. Position the BSM in the bracket and engage the retainers.
2. Position the BSM bracket to the tail lamp housing and secure in position with screws.
3. Connect the wire harness connectors to the BSM.
4. Install the appropriate rear tail lamp. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE, BODY CONTROL (BCM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Body Control Module (BCM) (1):

- The BCM is the configuration master for the vehicle. As the configuration master, the BCM broadcasts configuration data over the bus whenever the ignition is in the RUN state.
- Receives hardwired input from sensors and switches
- Provides logic and output control of certain electrical systems
- Provides load shedding logic and control
- Acts as the central gateway module for the Controller Area Network (CAN) and Local Interface Network (LIN) bus networks
- Supports flashing (reprogramming) of itself
- Is located behind the instrument panel above the right kick panel

Some advantages of the BCM include:

- CAN message optimizations
- Controls all exterior lighting outputs
- Intelligent Battery Sensor (IBS) connection on LIN to BCM
- Interior Lighting and Dimmable "Mood" Lighting

OPERATION

The BCM uses semiconductors or solid-state electronics, including transistors, to perform some of its required functions.

A transistor:

- Is similar to a relay
- Is used to turn an electrical circuit ON or OFF
- Is controlled by another circuit
- Has no moving parts
- Is an integral part of the Electronic Control Unit (ECU) circuit board
- Is often referred to as a "driver"

In the case of the BCM, the following drivers are used to distribute power to various electrical circuits:

- High Side Driver (HSD)
- Low Side Driver (LSD)

If a HSD or LSD is used, it will often be indicated on the wiring diagram by the word "ELECTRONICS" or "PCB" next to a dashed-box inside the ECU.

HSD

:

- Provides battery voltage (+) to power the load device requiring operation
- Can be used by an ECU to switch power (+) to an electrical circuit, which is typically grounded through its harness and associated circuitry

Some common examples of how the BCM uses a HSD include the:

- Horn
- Starter relay
- Ignition RUN/START
- Washer Pump

LSD

:

- Provides a ground (-) for the load device requiring operation
- Can be used by an ECU to switch ground (-) to an electrical circuit, which is typically powered through its harness and associated circuitry
- Starter relay

BCM FUNCTION

Since the BCM separates the branches of the bus networking systems, the BCM must act as a gateway module to allow communication between the different bus networks. The BCM will translate and share messages among all modules on the following bus networks:

- CAN-C
- CAN-Interior High Speed (IHS)
- LIN

The BCM provides the following diagnostic and service features:

- Works as the central gateway to translate and redistribute messages among the CAN-bus networks
- Diagnoses and reports hundreds of Diagnostic Trouble Codes (DTCs)
- Monitors the CAN bus for failures and logs network DTC "U" communication codes
- Supports reprogramming (flashing)
- Houses the vehicle configuration data

LIN MASTER - The BCM is a LIN master module to the following LIN slave components:

- Intelligent Battery Sensor
- Steering Wheel Switches (SWS)
- Auxiliary Switch Bank
- Remote Compass Module

- Inside Rearview Mirror

OPERATION CONTROL

The BCM operates the following functions:

- Exterior lighting
- Ignition control
- Horn
- Door lock control
- Interior Lighting
- Power window operation and function

Several inputs are used to alert the BCM to become active. The hardware wake-up inputs include:

- Headlamp Switch
- Hazard Switch
- Vehicle access point ajar switches
- Interior lamp load detection
- The BCM will also wake-up from module messages from the CAN-C, CAN-IHS, or LIN communication bus networks

STARTING SYSTEM MASTER

The BCM is the starting system master:

- Uses ignition position bus messages from the Radio Frequency Hub (RF-Hub) to generate vehicle ignition position (commanded ignition position).
- Works with the Powertrain Control Module (PCM) and various starting system components to start the vehicle.
- Signals the RF-Hub that the starting attempt has begun or has completed (engine may or may not be running).

MODES OF OPERATION

Customer Mode:

- All features will work as designed for the customer
- This mode is set by the dealer prior to vehicle delivery

Ship Mode:

- The BCM mode will be set to "Ship Mode" by the Certification test at the end of the vehicle assembly process
 - This mode will be set after all electrical testing is completed and the vehicle is ready to be shipped
- In Ship mode many non-critical vehicle features are disabled, minimizing any unnecessary battery drainage during shipping and storage
- The BCM will broadcast the "Ship Mode" message over the vehicle CAN bus so all other vehicle modules will receive the "Ship Mode" message and respond accordingly

The different BCM operating modes can be changed and verified using the scan tool. In addition to using the scan tool to verify and change the BCM mode, you can set a vehicle to/from Ship Mode by following these steps:

1. Place the ignition in the RUN position.

2. Turn on the four-way emergency flashers
3. Press and hold the left steering wheel "up" button for approximately 5 seconds.
4. The vehicle will switch modes.

The modes can be switched back and forth by using this method.

POWER ACCESSORY DELAY:

The BCM manages the Power Accessory Delay (PAD) system for the vehicle.

The PAD feature provides power to some accessory features such as power windows and sunroofs so that they can remain active after the ignition is cycled OFF. This allows the customer to finish closing windows, sun roofs etc. without having to keep the ignition system active. On vehicles equipped with a customer selectable options, the PAD time is programmable. The feature will time out after a specified period of time and is terminated when either front door is opened. PAD does not function when the vehicles ship mode feature is active.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

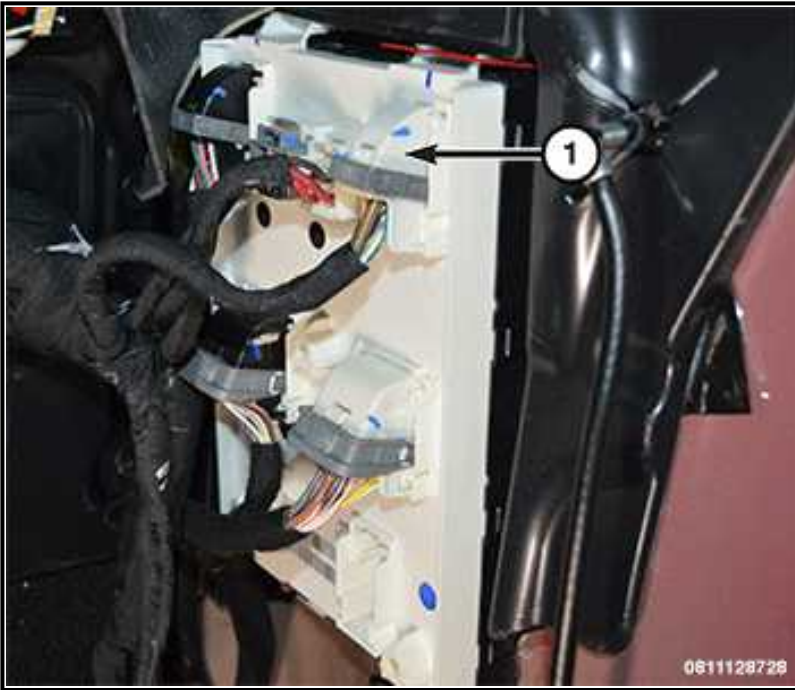
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Disconnect the right door wire harness connector and anchor clip.
3. Remove the right front door check strap. Refer to [CHECK, DOOR, REMOVAL AND INSTALLATION](#) .
4. Remove the door cowl trim panel. Refer to [PANEL, COWL TRIM, REMOVAL AND INSTALLATION](#) .

NOTE: The Body Control Module (BCM) is covered by a water shield which can be lifted up to access the lower mounting fasteners. The water shield is removed in the images for clarity.



5. Remove the mounting bracket fasteners (1) from the BCM.
6. Remove the BCM from the vehicle mounting bracket.



7. Disconnect the BCM wire harness connectors (1) and remove the BCM from the vehicle

INSTALLATION

1. Position the BCM to the vehicle for installation.
2. Connect the BCM wire harness connectors (1).

NOTE: Install water shield before the next step. The water shield was removed in the images for clarity.



3. Position the BCM in the vehicle mounting bracket.
4. Install the mounting bracket fasteners (1) for the BCM and tighten them to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
5. Install the door cowl trim cover. Refer to [PANEL, COWL TRIM, REMOVAL AND INSTALLATION](#) .
6. Install the right front door check strap. Refer to [CHECK, DOOR, REMOVAL AND INSTALLATION](#) .

7. Connect the door wire harness connector and anchor clip.
8. Connect the negative battery cable(s). Refer to the appropriate service information .
9. Perform BCM programming. Refer to **MODULE, BODY CONTROL (BCM), MODULE PROGRAMMING**.

NOTE: If the BCM does not program, please disconnect the battery, wait 15 seconds, reconnect the battery and run the BCM immobilizer replace routine again.

MODULE PROGRAMMING

When replacing any Electronic Control Unit (ECU), refer to the **IMMOBILIZER COMPONENTS AND REPLACEMENT GUIDE** . Refer to **STANDARD PROCEDURE**.

1. Connect the scan tool to the vehicle and manually enter the Vehicle Identification Number (VIN).
2. Perform the

"Restore Vehicle Configuration"

routine located in Guided Diagnostics.

NOTE: You will not have the ability to turn the vehicle on at this time so the routine will be ran in the key OFF position. Topology will only show a yellow Body Control Module (BCM) and blue Security Gateway Module (SGW). All other ECUs will be grey at this time.

3. After the Restore Vehicle Configuration routine you must remove the micro-pod and wait at least 60-90 seconds before reconnecting it to the vehicle. Once reconnected to the vehicle, the topology will populate.
4. Navigate to the Radio Frequency Hub (RF-Hub) and run the **"BCM Immobilizer Replace"** routine.
5. After completing the BCM Immobilizer Replace routine, verify the vehicle starts and clear any Diagnostic Trouble Codes (DTC).

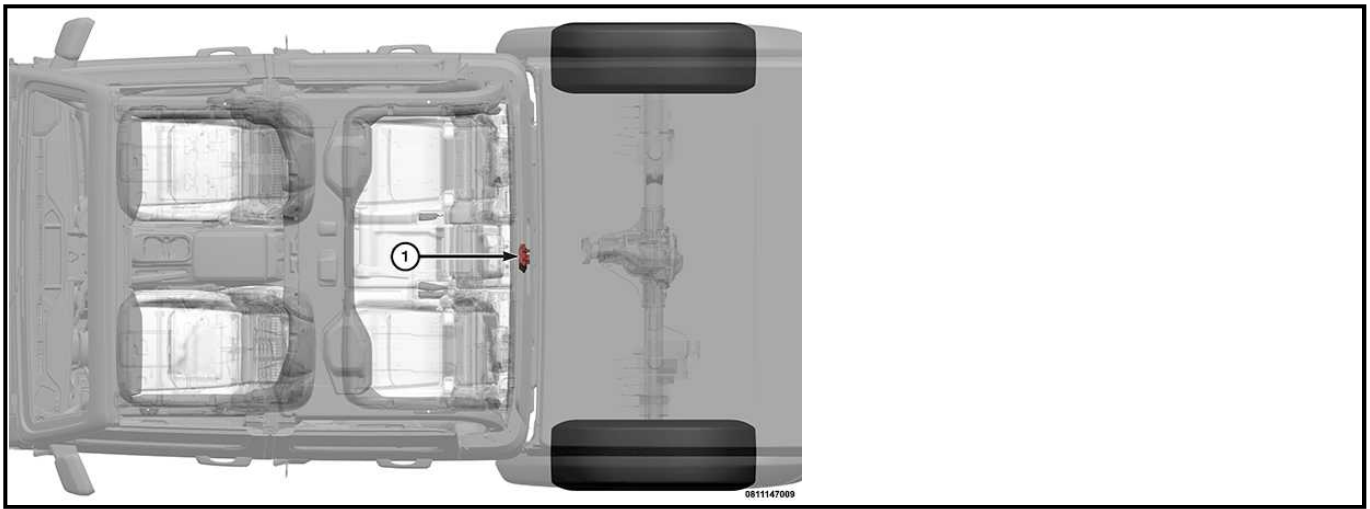
NOTE: If the BCM does not program, disconnect the battery, wait 15 seconds, reconnect the battery and run the BCM immobilizer replace routine again.

MODULE, CENTRAL VISION PROCESSING (CVPM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Central Vision Processing Module (CVPM) (1) generates the view in the Front View Camera (FVC) and the Rear View Camera (RVC) system displays according to inputs received from the two external cameras and driver touch screen inputs via a Low Voltage Differential Signal (LVDS) coaxial cable. The CVPM combines the video feeds together and outputs it to the display screen.

The wiring harness connector to the CVPM includes the power and the video feed connections. The CVPM video feed connections are as follows:

- Light Green - Front Camera.
- Orange - Rear Camera.
- Violet - to the Radio.

The CVPM is located on the rear cabin wall.

OPERATION

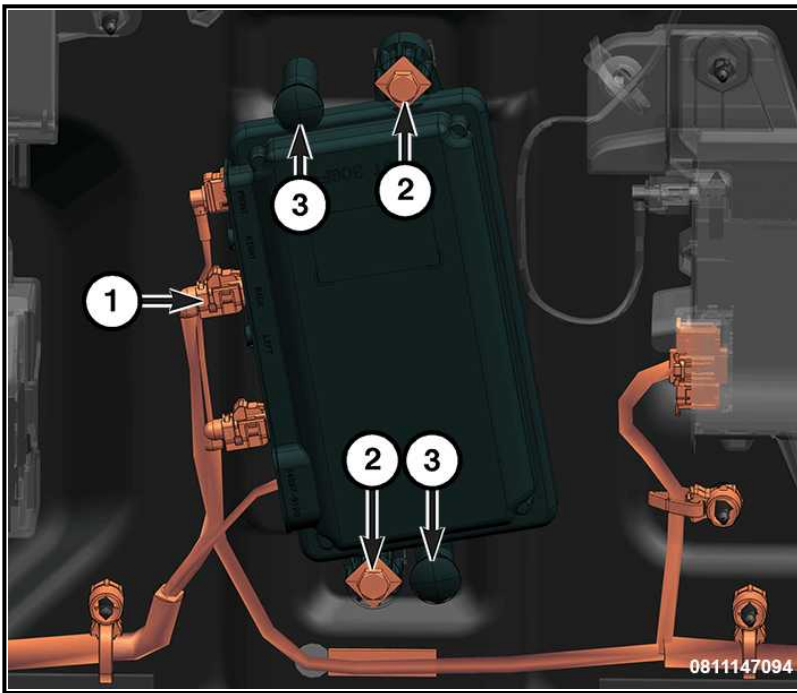
For additional information on the Front and Rear View Camera system functionality and the CVPMs role in the operation of this system. Refer to [**DESCRIPTION AND OPERATION**](#) .

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the subwoofer. Refer to [**SPEAKER, REMOVAL AND INSTALLATION**](#) .



3. Disconnect the wire harness connections (1) from the Central Vision Processing Module (CVPM).
4. Remove two bolts (2) and two push fasteners (3) securing the CVPM to the rear cabin wall.
5. Remove the CVPM from the rear cabin wall.

INSTALLATION

1. Install the CVPM to the rear cabin wall using two bolts and two push fasteners. Tighten the two CVPM bolts to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
2. Connect the wire harness connections to the CVPM.
3. Install the subwoofer. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .
5. Using the diagnostic scan tool, perform CVPM programming. Refer to [MODULE, CENTRAL VISION PROCESSING \(CVPM\), MODULE PROGRAMMING](#).

MODULE PROGRAMMING

CVPM PROGRAMMING

The Central Vision Processing Module (CVPM) will need to be programmed when service is performed on any of the surround view cameras or the CVPM itself. The calibration routine is located in the "Surround View Camera" selection. Navigate to the "Misc. Functions" tab and select the "CVPM Service Calibration" routine to begin the calibration process.

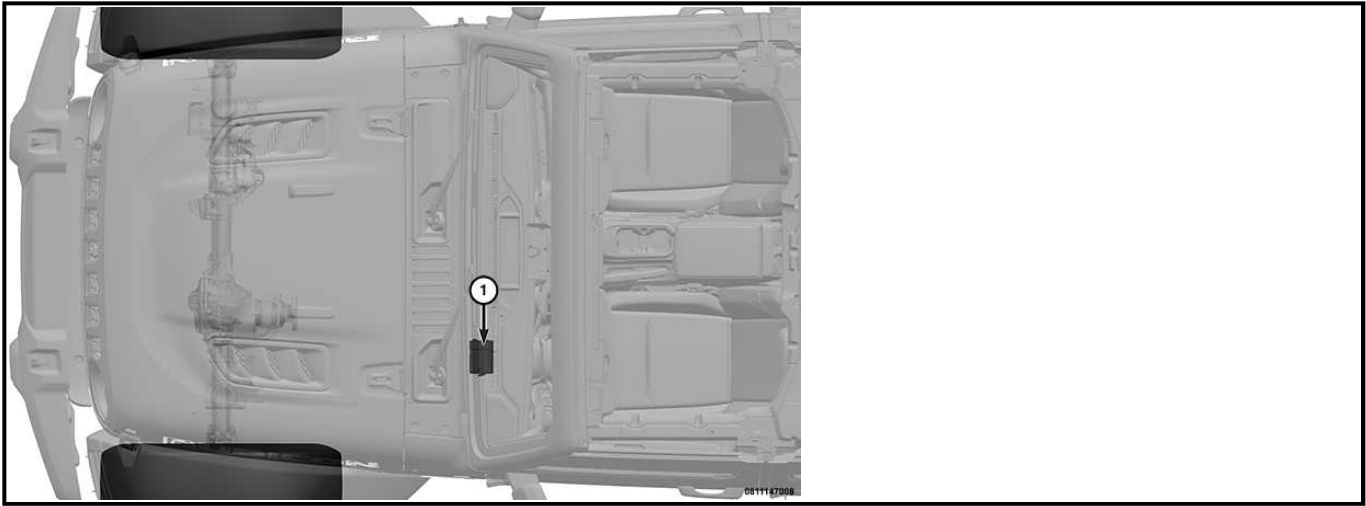
NOTE: To run this routine, all exterior mirrors must be fully extended and all of the doors must be closed. The vehicle will need to be driven between 3 and 13 kilometers/hour (km/h) 2 and 8 miles per hour (mph) in a straight line. The camera is looking for features such as paint lines, other vehicles or other physical objects. It is recommended to perform the calibration in a parking lot environment.

MODULE, COMFORT SEAT AND WHEEL (CSWM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Comfort Seat and Wheel Module (CSWM) (1) is located below steering column and the Power Inverter Module (PIM) (if equipped) in the instrument panel. It has a multiple wire harness connectors (Controller Area Network-Interior High Speed/CAN-IHS, Power, Front Heat, Front Vent and Heated Steering Wheel connections) and a push pin style retainer that secures it to the seat pan.

The CSWM provides output signals on the CAN-IHS bus as well as receives CAN-IHS bus signals from the various modules. The seat thermistor is hard wired to the CSWM.

Heated Seats - The CSWM uses a Pulse Width Modulation (PWM) to provide power to the seat cushion and back heating elements. The temperature sensor thermistor is located in the seat cushion. The thermistor sensor feedbacks from each seat heating element to the CSWM to regulate the heater outputs to prevent any seat temperature to rise above set points. Seat heating has two selectable heat settings which are HI and LO. Depending on thermistor reading, the CSWM will start the heater output by adjusting the PWM heat level according to the calibration table.

Heated Steering Wheel - The CSWM provides power to the steering wheel heating element. The heated steering wheel is standard when the vehicle is equipped with front heated seats. During normal operation, the CSWM will switch on the power for the heated wheel only if the engine is running. The heated steering wheel temperature sensor sends that information over a Local Interface Network (LIN) bus through the Steering Column Control Module (SCCM) to the Body Control Module (BCM). The thermistor sensor feedbacks from the steering wheel heating element via the CAN Internal High Speed (IHS) bus to the CSWM regulating the heater output to prevent the wheel temperature to rise above the maximum threshold temperature set point.

OPERATION

Heated Systems Modules:

- The CSWM controls the heated seat system.
- The Steering Column Control Module (SCCM) is the interface (Power feed and return) between the heated steering wheel element and the vehicle.
- The Steering Wheel Switch (SWS) converts hard wired sense and return information into a LIN bus message and sends this message to the BCM.
- The BCM gates messages between the CAN-Chassis (CAN-C) bus and the CAN-IHS bus. Additionally, the BCM provides vehicle configuration data to the CSWM.

Refer to [**DESCRIPTION AND OPERATION**](#) for heated steering wheel information.

Heated Seats:

- The heated seat system operates on battery current received through fused ignition switch output (RUN) circuits and will only operate when the engine is running.
- The CSWM directly provides power to the seat heating elements in the seat cushions and seat backs for seat heating.

- The driver seat heat system and passenger seat heat system each consist of a cushion element connected in parallel with a back element.
- A thermistor sensor feedback from each seat heating element to the CSWM is used to regulate the heater outputs to prevent any seats temperature from rising above the set points. If a seat temperature exceeds the set point the CSWM automatically disables the system.
 - The high level cutoff value range is from 50B° - 60B° C (120B° - 140B° F) in increments of 1 degrees Fahrenheit. The typical value is 54B° C (129B° F).
 - The low level cutoff value range is from 50B° - 60B° C (120B° - 140B° F) in increments of 1 degrees Fahrenheit. The typical value is 55B° C (131B° F).
- The CSWM will also turn off the heated seat elements if an open or short in the heating element circuit is detected.
- Each time a heated seat request signal is received by the CSWM, the heated seat output will cycle from Off to High, High to Low and Low to Off. (i.e the first press cycles from Off to High, the next press cycles from High to Low and the next press cycles from Low to Off.)
- When the CSWM receives the actuation request, the CSWM activates the heating element output at the high level and transmits a message on the CAN-IHS bus to indicate the current output state is high.
- The CSWM automatically transitions the output from high to low after a maximum period of 60 minutes has elapsed and transmits a message on the CAN-IHS bus to indicate the current output state is low.
- The CSWM automatically transitions the output from low to off after a maximum period of 45 minutes has elapsed and transmits a message on the CAN-IHS bus to indicate the current output state is off.

When pressing the heated seat switch:

- A CAN-IHS bus message request is generated.
- The CSWM receives the "Heated Seat request" from the CAN-IHS bus.
- The CSWM broadcasts a confirmation of actuation message over the CAN-IHS bus.
- The CSWM energizes an integral solid-state relay, which supplies Pulse Width Modulated (PWM) current to the heating elements of the designated seat(s).
- The CSWM monitors the seat temperature.

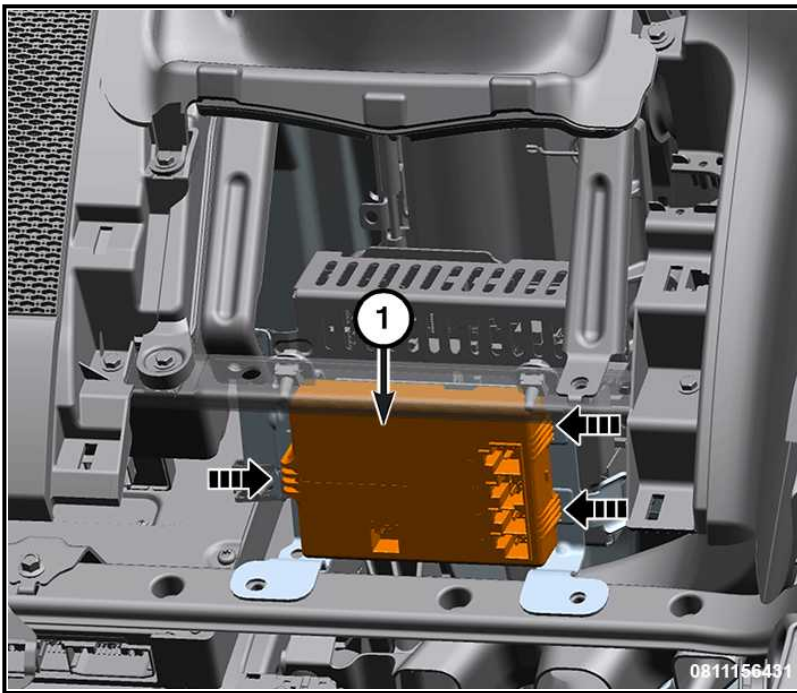
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable. Wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in possible serious or fatal injury.

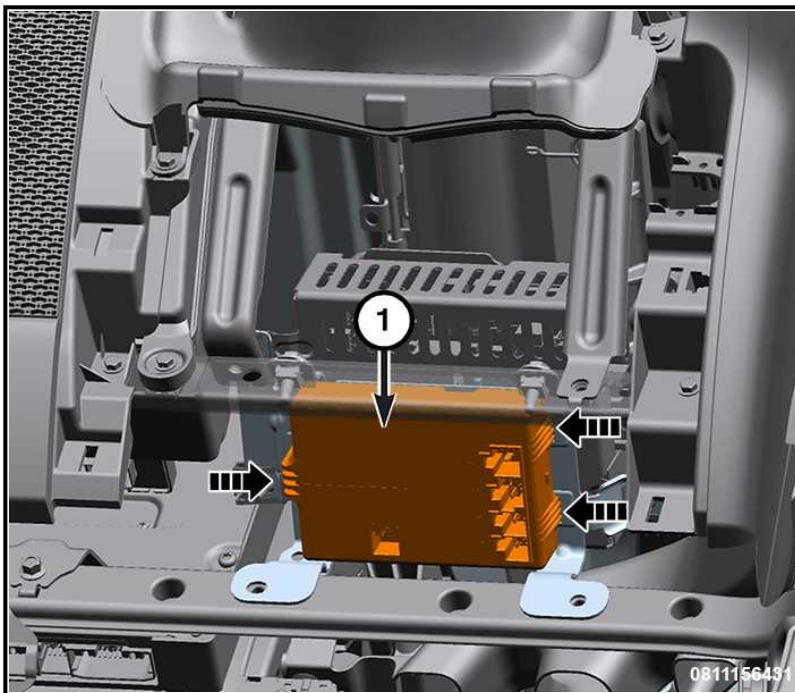
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the Steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector from the CSWM.
4. Using an appropriate trim tool, disengage the lock tabs that secures the Comfort Seat Wheel Module (CSWM) (1) to the instrument panel support.
5. Remove the CSWM from the instrument panel.

INSTALLATION

CAUTION: Properly align the tab and retainer for the Heated Seat Module (HSM) to the holes in the instrument panel support, prior to engagement. Failure to follow these instructions may result in damage to the HSM tab and retainer.



1. Connect the wire harness to the CSWM (1).
2. Position the CSWM to the instrument panel.
3. Align the tabs into the slots of the instrument panel support and fully engage the lock tab retainer to the support.
4. Install the steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#).

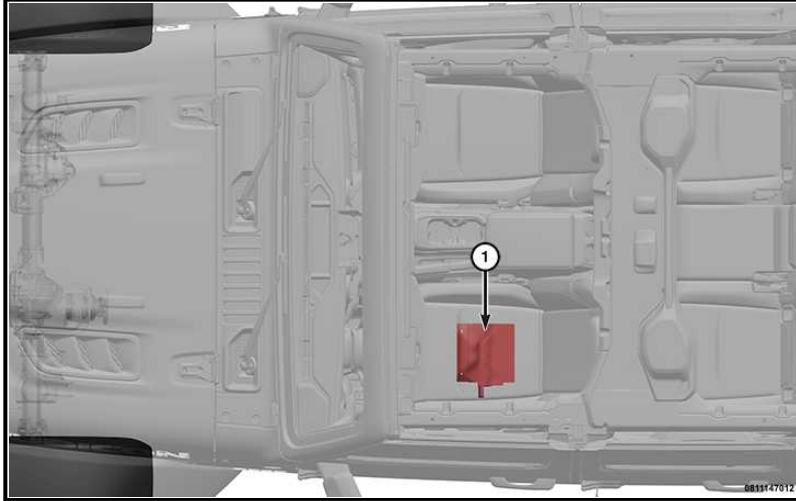
5. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE, DRIVER PRESENCE DETECTION (DPDM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Driver Presence Detection Module (DPDM) (1) functions as a back-up sensor used to detect when the driver has entered or exited the vehicle in the absence of the door ajar sensor. It is a modified version of an Occupant Classification Module (OCM), which is a small Electronic Control Unit (ECU) attached by hose to a fluid filled bladder that is located against the bottom surface of the seat foam within the passenger seat structure.

OPERATION

The DPDM is always powered and sending status messages across the Controller Area Network - Chassis (CAN-C) data bus, but is only being monitored when the driver door is removed. The DPDM receives its ignition RUN command status from the Body Control Module (BCM) as well as the vehicle configuration strategy. This strategy is used by the DPDM ECU to select the proper parameter set and calibrations for the vehicle type based on the vehicle line and model year. In most cases, the driver presence message status is used in the same way that the door ajar sensor is used. The DPDM handles the sensor calculations internally to the ECU and transmits a status signal across the CAN-C bus for other ECUs to use. This status signal provides a Faulted/Not Faulted data bit and a status value that is typically one of four values:

- Undetermined (usually used during ECU initialization and calibration)
- Occupied (Driver Present)
- Unoccupied (Seat Empty)
- SNA (Signal Not Available / Loss of Communication)

The status message is updated every 200 milliseconds (ms) on the CAN-C bus.

The DPDM also provides diagnostic data from the internal pressure sensor which is a 0-255 count raw / unfiltered reading. The diagnostic data is also transmitted at a rate of every 50 ms.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

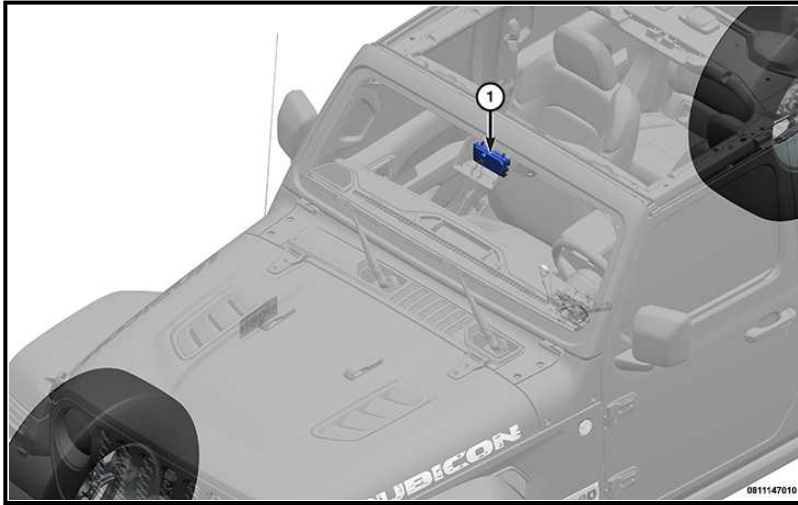
The Driver Presence Detection Module (DPDM) is serviced as an assembly with the driver seat cushion pad. For removal and installation of the driver seat cushion pad, Refer to [**COVER, SEAT CUSHION, REMOVAL AND INSTALLATION**](#)

MODULE, DRIVERS ASSISTANCE SYSTEM (DASM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The interior windshield mounted Drivers Assistance System Module (DASM) (1) includes a camera sensor component and a radar sensor component both housed within a common single module housing. The camera component generally captures camera images of an area in front of the vehicle. The radar component emits fan-shaped radar beams so that objects generally in front of the vehicle reflect the emitted radar back to the sensor. The DASM processes the radar and vision data collected by the corresponding camera component and radar component and processes the information to support the various Drivers Assistance systems equipped on this vehicle.

The DASM communicates with other vehicle control modules via both public and private Controller Area Network (CAN) bus to provide the following features sets:

- Conventional Cruise Control - Only when equipped with a DASM.
- Adaptive Cruise Control with Stop and Go (ACC+)
- Automatic High Beam Control (AHBC)
- Advanced Emergency Braking (AEB)
- Full Speed Forward Collision Warning with AEB (FSRFCW+)

OPERATION

The DASM uses an integral radar and camera, by means of data fusion, to detect vehicles in the forward path of the vehicle that are moving, stopped or stationary and lane markings on the road.

How the DASM integrated or controls the various Drivers Assistance systems is covered in their respective sections.

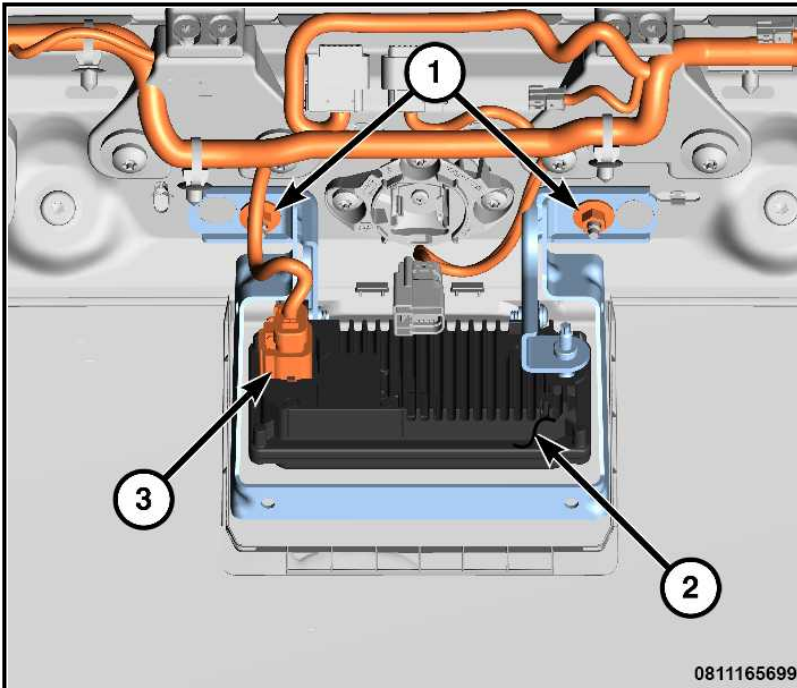
- ACC with Stop and Go or Conventional Cruise Control when equipped with a DASM. Refer to [DESCRIPTION AND OPERATION](#) .
- Automatic High Beam Control (AHBC). Refer to [DESCRIPTION AND OPERATION](#) .
- Full Speed FCW+. Refer to [DESCRIPTION AND OPERATION](#) .

REMOVAL AND INSTALLATION

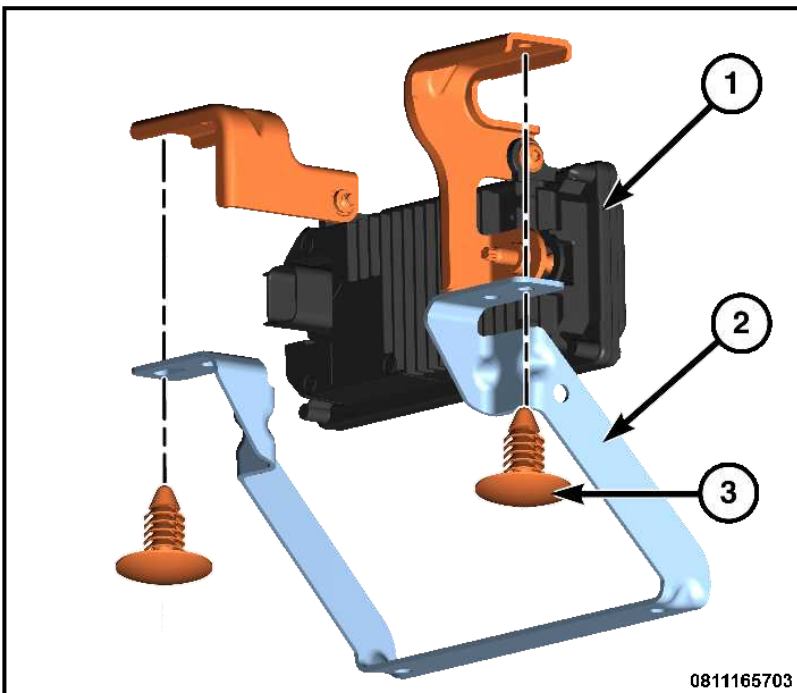
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the header trim. Refer to [**PANEL, HEADER, REMOVAL AND INSTALLATION**](#) .



3. Disconnect the Driver Assistance System Module (DASM) (2) wire harness connector (3).
4. Remove the fasteners (1) securing the DASM assembly (2) to the windshield header and remove the DASM (2) from the vehicle.



5. Remove the DASM bracket fasteners (3) and remove the DASM bracket (2) from the DASM (1).

INSTALLATION

1. Position the DASM bracket on the DASM assembly and install the fasteners.
2. Position the DASM to the windshield header and install the fasteners. Tighten the fasteners securely.
3. Connect the wire harness connector.
4. Install the header trim. Refer to [**PANEL, HEADER, REMOVAL AND INSTALLATION**](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE PROGRAMMING

NOTE: Aftermarket add-ons that protrude into the Driver Assistance System Module (DASM) field of view will inhibit the ability to calibrate and will inhibit functionality. Please remove any such components prior to performing the calibration procedure.

This DASM calibration procedure is required when the:

- DASM and/or DASM and bracket have been removed.
- A **NEW** windshield is being installed to the vehicle.
- Tire diameter has been changed
- Calibration not learned Diagnostic Trouble Code (DTC) (C008F-00) or Sensor Adjustment Required DTC (C14A4-00) are present

NOTE: If the windshield is lowered down, install the protective cover to protect the DASM. The DASM will not require programming when the windshield is raised back to its normal position as long as the DASM has not been struck or moved while the windshield was in its lowered position.

1. Using a digital inclinometer, read and record the vertical angle by holding the inclinometer against the cooling ribs on the back of the DASM.



2. Once the DASM angle has been determined, and if an adjustment is needed, use an e5 Torx tool to adjust the DASM adjustment head screw (1). Move in the appropriate direction to adjust the module, remove the torx wrench prior to rechecking the vertical alignment.

NOTE: The adjustment specification is: -1 ± 0.2 degree from vertical. The preference is for -1 ± 0.1 degree from vertical.



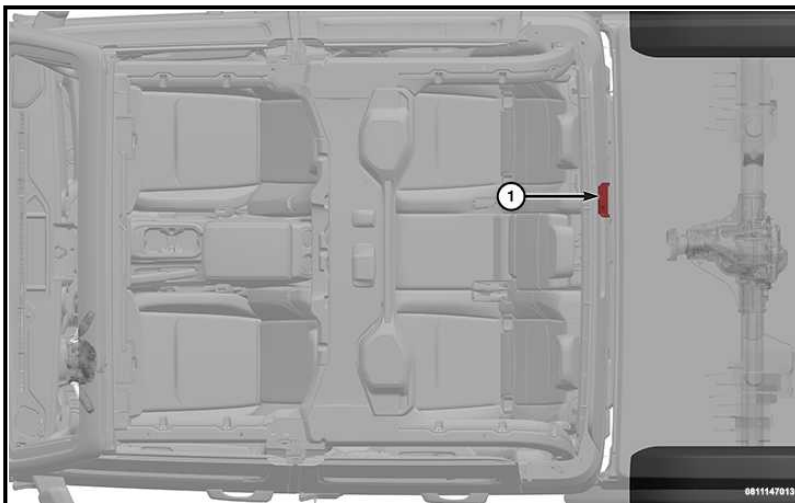
3. Repeat step 1 and step 2 until the DASM is within the adjustment specification.
4. After completing the vertical alignment, connect the diagnostic scan tool to the vehicle.
5. Select the "DASM ECU" and then select the "Miscellaneous Functions" tab.
6. Select and run the "DASM Auto Alignment" procedure and follow the on screen prompts to complete DASM calibration.

MODULE, DRIVETRAIN CONTROL (DTCM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Drivetrain Control Module (DTCM) (1) is located on the rear cabin wall. The DTCM communicates with the vehicle systems through the Controller Area Network - Chassis (CAN-C) bus to optimize the performance of the vehicles All Wheel Drive (AWD) functionality.

The DTCM is powered by the front Power Distribution Center (PDC).

OPERATION

DTCM and the Transfer Case status:

The DTCM monitors the state of the transfer case and reports the current operating mode, mode shift, and range to the vehicle over the CAN-C data bus.

A mode shift is defined as a shift between any of following transfer case states:

- 2WD
- 4WD Lock
- 4WD Auto (if equipped with the BW44-44 transfer case)

If the DTCM receives a request to perform a mode shift from 2WD into either of the 4WD modes, the DTCM will verify that the wheel speeds are within an acceptable range prior to engaging the Front Axle Disconnect (FAD).

DTCM interaction with the Powertrain Control Module (PCM):

To improve range shifts beginning in 4LO, the PCM needs to raise idle speed when shifting out of 4LO. The Powertrain Control Module (PCM) will perform the following procedure:

- The PCM will increase the engine idle for a 4WD shift when the initial system state is in the 4LO mode
- The PCM challenges the Transmission Control Module (TCM) to determine if the transmission must be in neutral. The transmission needs to be in neutral for the engine idle increase to occur

If the above conditions are true, the PCM will monitor for a DTCM status signal over the bus for a change of state from 4LO. Once the change of state has occurred, the PCM will raise engine idle speed target to the calibrated value. The PCM will cancel the idle increase when the transfer case completes its shift.

DTCM and Transfer Case Clutch Torque Control

The DTCM provides the amount of torque currently being transferred across the transfer case clutch using CAN-C data signals. If the transfer case torque cannot be determined due to sensor failure or other system failures, the DTCM will set an internal Diagnostic Trouble Code (DTC).

Slip Correction - The DTCM will transfer torque to the front wheels upon wheel slip. Wheel slip threshold is calibratable and will be different for each mode. Wheel slip is calculated by the DTCM by using the available wheel speed sensor messages on the vehicle CAN-C bus from the Antilock Brake System (ABS) module. The wheel speed sensor data signals include each individual wheels Revolution Per Minute (RPM) values.

Over/Under steer control - Yaw Event (under and over steer): The DTCM continuously monitors vehicle yaw versus the vehicle intended path (yaw error) and transfers the appropriate level of torque to correct the yaw error. The level of yaw correction is calibratable and may be different for each mode.

The DTCM uses the following signals from the ABS module to determine vehicle over/under steer dynamics:

- ESP_A4.VehYawRate_Raw
- ESP_A4.VehYawRate_Offset
- ESP_A4.VehAccel_X
- ESP_A4.VehAccel_X_Offset
- ESP_A4.VehAccel_Y
- ESP_A4.VehAccel_Y_Offset

The DTCM and Front Axle Disconnect Triggers - Wheel Slip:

The DTCM uses these signals from the ABS module to calculate difference in wheel speeds when equipped with the front axle disconnect:

- ESP_A6.WhlRPM_FL - This is the left front wheels RPM value
- ESP_A6.WhlRPM_FR - This is the right front wheels RPM value

- ESP_A6.WhlRPM_RL - This is the left rear wheels RPM value
- ESP_A6.WhlRPM_RR - This is the right rear wheels RPM value

If the difference in wheel speeds is greater than a calibratable value of 32 km/h (16 mph), the DTCM automatically engages the 4WD system to provide the best possible traction.

DTCM and Incoming Torque Requests - For vehicles equipped with an active transfer case, the DTCM will perform the following requirements:

If Electronic Stability Control (ESC) torque requests are received, the DTCM will command the transfer case clutch to fully open.

If ESC Torque Mode Request Feedbacks are received, the DTCM will provide feedback to the ABS module regarding the DTCM operation mode. This allows the ABS modules ESC function to determine if the DTCM is responding to the ESC request.

DTCM Outgoing Torque Requests - Engine Torque Reduction:

The DTCM All Wheel Drive (AWD) controller can request an effective flywheel torque over the CAN-C network as a limit under specific conditions that can harm the driveline. The AWD system has a thermal model in the DTCM. When the DTCM detects a possible overheat condition, it will temporarily request reduced torque from the PCM. The DTCM will continuously send out a constant value torque reduction request until the AWD system no longer needs thermal protection.

The PCM receives the AWD torque request and will then need to verify the request as valid. The DTCM will only send out a torque demand and an actual flywheel torque request. This torque request is treated as a minimum mode torque request. The minimum mode takes the minimum of driver demand, electronic stability torque, acceleration torque and AWD torque to be used for torque calculations.

When the PCM receives the DTCM torque request, it compares the request with an internal calibration limit. If the request is less than this limit value, the request will not be honored. Otherwise, the DTCM torque request is valid and the torque reduction request will be used with ramp in and ramp out rates that limit how quickly the torque can change. Both the ramp in rate and the ramp out rate will use separate calibrations. There is also a calibrated timer limit for how long the active request is to be considered valid.

The DTCM calculates and transmits a Cyclical Redundancy Check (CRC) and a message counter with each transmission message regardless of the presence of an active DTCM torque request. The PCM receives the entire message and compares the received CRC and message counter to its own expected values to verify the validity of the received message. If either of these checks fail, the PCM will deny the torque request and set the appropriate DTC for implausible data.

Rotary Switch output to the DTCM The BCM interfaces with the Drive/Terrain rotary mode switch. This feature applies to vehicles equipped with Customer Selectable Transmission Drive Modes. When the vehicle is equipped with these features (for example, Transmission Drive Modes) the user will have the rotary Drive/Terrain mode switch to make the desired selection. The user will be able to select any Drive Mode from the available options when the ignition status is in the run/start position, regardless of engine state. The BCM, will keep the request active for the entire time the mode is requested as an output to the DTCM.

DTCM Indication Management of the Transfer Case Status to the Instrument Panel Cluster (IPC)

The DTCM determines and sends the transfer case position status messages over the bus network for the IPC to display. For the part time transfer case, the DTCM sends the following transfer case status messages:

- 2H (2 Wheel High)
- 4H (4WD High)
- N (Neutral)
- 4L (4WD Low)

For the Full time Transfer Case, the DTCM sends the following transfer case status messages:

- 2H (2 Wheel High)
- 4H Auto (4WD Full Time)
- 4H Part Time (4WD Part Time)
- N (Neutral)
- 4L (4WD Low)

When the vehicle is equipped with an automatic transmission, the DTCM will also broadcast the "Neutral Shifter Position Warning" as needed.

DTCM IPC Indication Requirements:

The DTCM sends a specific CAN-C messages to the IPC which is used by the IPC in identifying appropriate message or series of messages to be displayed to the driver.

The IPC will use above DTCM status message to indicate the transfer case state and display this to the driver.

Service 4WD IPC Indication -The DTCM will request the "Service 4WD" tell-tale via a CAN-C signal when any of the following conditions are true:

- A DTC is stored/active that results in no functionality
- When a level of decreased functionality exists that a customer should be notified of.

The IPC enables its own internal logic to display the message when commanded.

If a DTC is stored or active that results in no functionality or a level of decreased functionality exists that a customer should be notified of, the IPC will display messages to the driver indicative of the experienced condition. The following table covers some of the messages shown on the IPC:

MESSAGE	EXPLANATION	POTENTIAL CAUSES
4WD System Temporarily Unavailable	IPC message informing driver of generic fault of 4WD system	Loss of communication with other modules or a low tire pressure condition
4WD Neutral Warning	Vehicle May Move Even in Park	This is a transfer case in N eutral warning
Service 4WD System	Service Required Message	The message will timeout, but the Light Emitting Diode (LED) indicator on IPC will stay illuminated
Mismatched Tire Size 4WD Reduced Performance	Spare Tire Detected	This message displays for calibratable time period when module software detects mini spare is in use
4WD Overheated Temporarily Unavailable	Actuator Over Temp	This message displays for calibratable time period when the actuator is over temp and a request is shown to the customer to perform a range shift or the neutral shift
4WD Overheated Performance Temporarily Reduced	Clutch Over Temp	Used to inform the driver that 4WD Auto is not currently available due to a clutch over heat condition

MESSAGE	EXPLANATION	POTENTIAL CAUSES
B	B	B
This table is not intended to replace diagnostic methods. Normal diagnostic methods should still be followed.		

Locker Management ASBM> <BCM> <DTCM

The Auxiliary Switch Bank Module (ASBM) is the interface between the driver and the Electronic Locker management system. The ASBM reads two inputs:

ASBM Switch 1: Driver selection of which axle locker should be engaged. This switch is read using button pressed or button not pressed logic. This switch is a three position mono-stable toggle switch that has the following positions:

- UP: Driver request to engage the front and the rear axle lockers
- MIDDLE: Default position of the switch. The switch will be in this position when there is no active driver request to change the axle locker state
- DOWN : Driver request to engage the rear axle locker only

ASBM Switch 2: Driver selection to disengage ALL axle lockers. This switch is also read using button pressed or button not pressed logic and it has the following 2 positions:

- PRESSED: Driver is requesting to disengage axle lockers
- NOT PRESSED: No driver button press active

The BCM gates signals for the ASBM between the Local Interior Network (LIN) bus and the CAN-C bus. The DTCM receives the request from the BCM over the CAN-C network bus to engage the axle lockers. The DTCM evaluates the interlocks to determine if conditions are met to lock the axles. If conditions are met to lock the axles, the DTCM attempts to lock the front or rear axle. If conditions are not met to lock axles, the DTCM will do one of the following depending on the type of request and the current vehicle conditions:

- Reject the locker engagement and request the IPC to describe which conditions are not met to achieve engagement
- Request the IPC to describe which conditions are not met and allow the driver time to correct the conditions preventing the locker engagement before rejecting the shift

The BCM receives DTCM output CAN-C messages containing ASBM switch LED illumination requests. The BCM gates these DTCM CAN-C messages to LIN message request and then sends these message requests to the ASBM to illuminate the appropriate switch based on the message received, front or rear.

DTCM and the Axle Locker Functionality

The DTCM receives the gated ASBM ON or OFF signals to request front and rear axle locker engagement as well as the disengagement requests from the customer.

If the DTCM determines that a valid request to engage axle lockers has been made, the DTCM evaluates the engagement interlocks. If all axle locker engagement interlocks are satisfied, the DTCM will attempt to lock the desired axle(s). If all axle locker engagement interlocks are not satisfied, the DTCM will send data bus messages to the IPC to display to the driver which conditions must be satisfied prior to an attempt to locking the desired axle(s) can be made.

The DTCM also sends a CAN-C message to the IPC to request a "Service Axle Locker System" message be displayed to the driver. Any time there is a DTC set in the axle locker system, this message will display to the customer. Conditions such as loss of communication or other mechanical or electrical functional axle locker component issues can set a DTC.

DTCM and the Rear Axle Locker

When the DTCM receives a request to lock the rear axle, each of the following interlocks **must** be satisfied before attempting a locking event:

- The DTCM will only initiate a rear axle locker engagement if the ignition is in "RUN" state (CmdIgnSts = RUN)
- The DTCM will only initiate a rear axle locker engagement if transfer case is operating in low range (4LO)
- The DTCM will only initiate a rear axle locker engagement if vehicle speed is less than or equal to the calibratable value of 16 km/h (10 mph)
- The DTCM will only initiate a rear axle locker engagement if the difference in rear wheel speeds is less than or equal to the calibratable value 32 km/h (20 mph)

DTCM and the Front Axle Locker

When the DTCM receives a request to lock both front and Rear axles, each of the following interlocks **must** be satisfied before attempting a locking event

- The DTCM will only initiate a rear axle locker engagement if the ignition is in "RUN" state (CmdIgnSts = RUN)
- The DTCM will only initiate a rear axle locker engagement if transfer case is operating in low range (4LO)
- The DTCM will only initiate a front axle locker engagement if the rear axle locker is already engaged
- The DTCM will only initiate a rear axle locker engagement if vehicle speed is less than or equal to the calibratable value of 16 km/h (10 mph)
- The DTCM will only initiate a rear axle locker engagement if the difference in rear wheel speeds is less than or equal to the calibratable value 32 km/h (20 mph)

DTCM and the Auto-Locker Functionality - The DTCM is capable of automatically engaging or disengaging axle lockers.

Automatic locker disengage involving the transfer case range:

- The DTCM will disengage the front axle locker when the transfer case is shifted from 4WD Low
- The DTCM will disengage the rear axle locker when the transfer case is shifted from 4WD Low

Automatic locker disengage involving the ignition position:

- The DTCM will disengage the rear axle lockers when the ignition position is switched to "OFF" or "ACC"
- The DTCM will disengage both the front and rear axle lockers when ignition position is switched to "OFF" or "ACC"

Automatic locker disengage involving a locked rear axle locker AND the vehicle is equipped with a front axle locker:

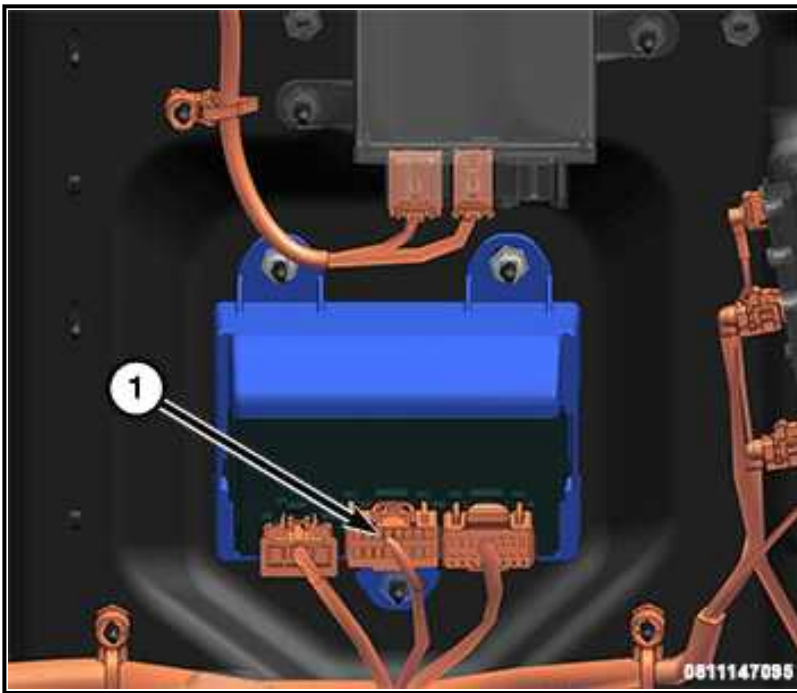
If the front axle locker is engaged, and the rear axle locker state changes from LOCKED to UNLOCKED, the DTCM will automatically disengage the front axle locker

REMOVAL AND INSTALLATION

DRIVETRAIN CONTROL MODULE (DTCM)

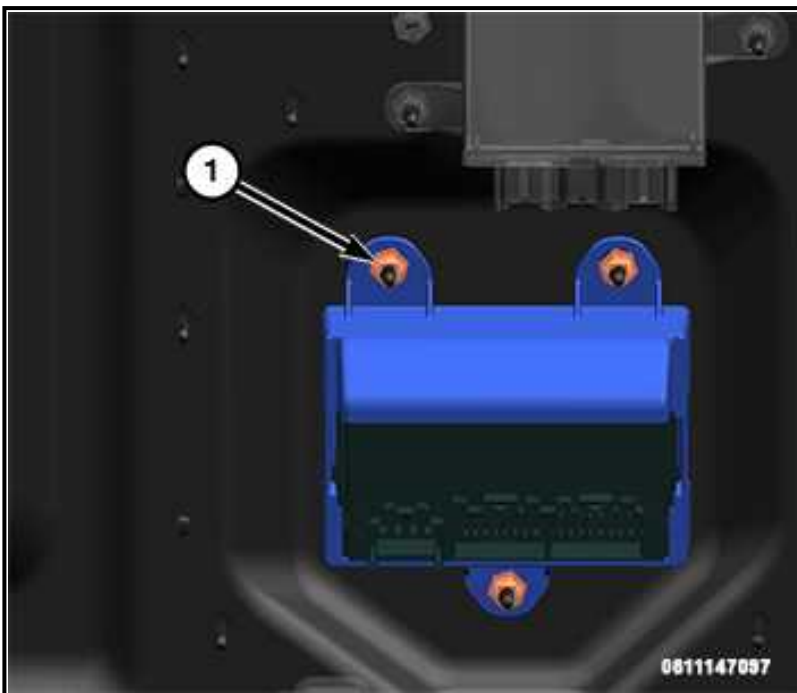
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the rear cabin wall trim panel. Refer to **PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION** .



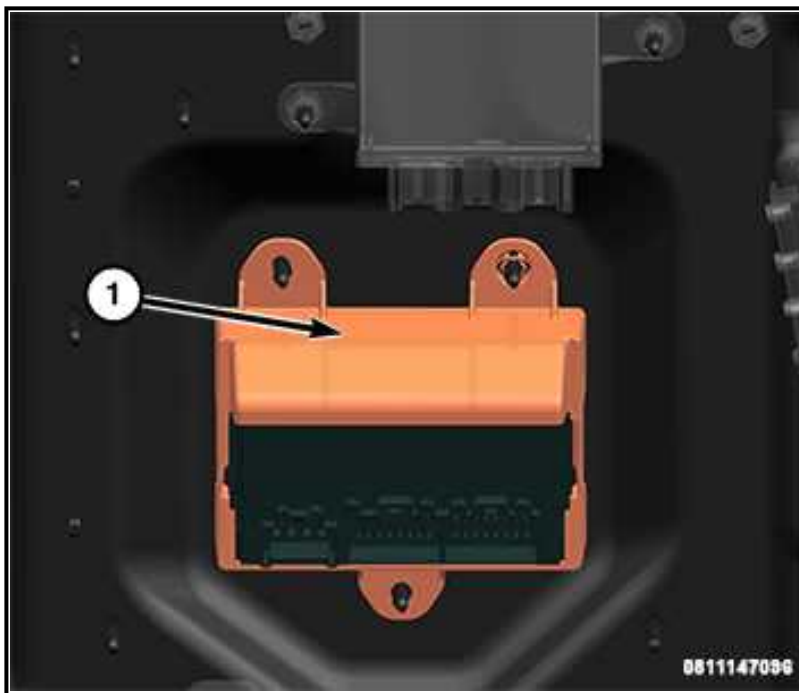
1 - DTCM Harness Connectors

3. Disconnect all wire harness connectors from the Drivetrain Control Module (DTCM).



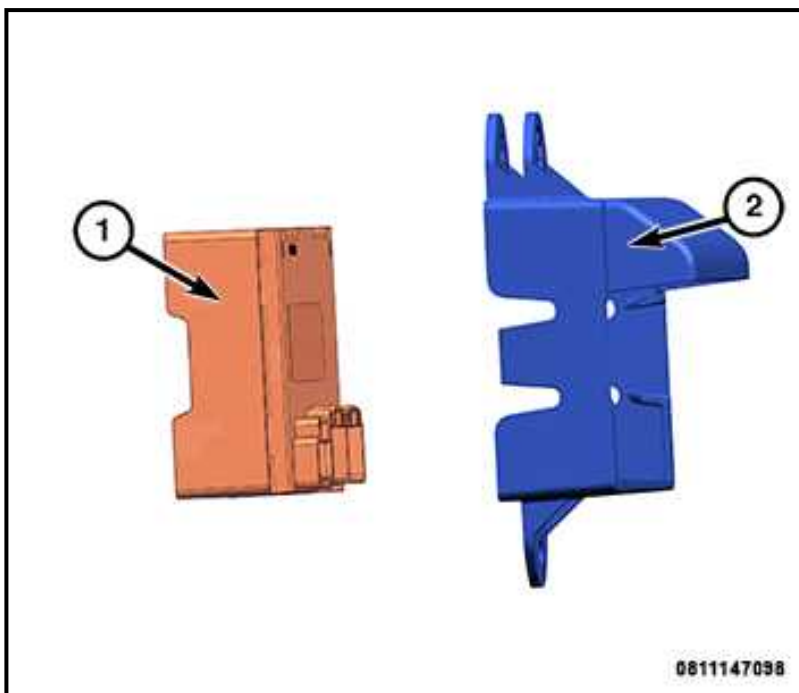
1 - DTCM Nuts

4. Remove the nuts securing the DTCM bracket to the rear cabin wall.



1 - DTCM Bracket

5. Remove the DTCM with bracket from the rear cabin wall mounting studs.



1 - DTCM

2 - DTCM Bracket

6. Separate the DTCM from the DTCM bracket.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- If replacing the DTCM, the transfer case, or both, use the scan tool to perform the Non-Volatile Memory Reset procedure.

- Perform the DTCM verification test. Refer to [STANDARD PROCEDURE](#) .

TORQUE SPECIFICATIONS

MODULES AND ACCESSORIES

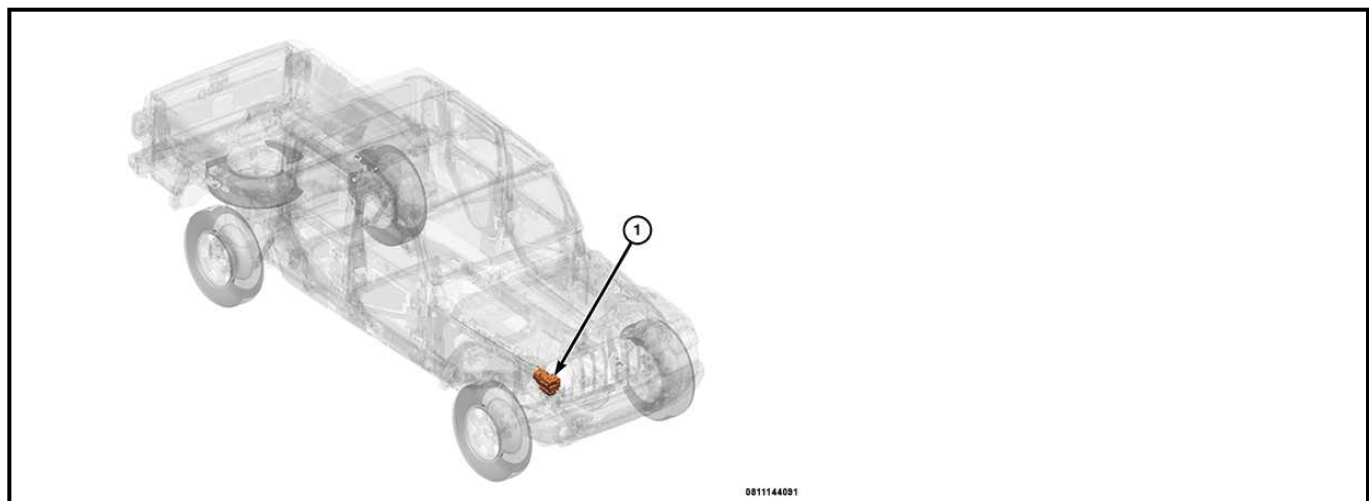
DESCRIPTION	SPECIFICATION	COMMENT
Amplifier to Body	5 N.m (44 In. Lbs.)	-
BCM to Body	5 N.m (44 In. Lbs.)	-
Central Vision Processing Module (CVPM) to Body Bolts	5 N.m (44 In. Lbs.)	-
DTCM Bracket Mounting Nuts	9 N.m (82 In. Lbs.)	-
EPB Nut	6 N.m (53 In. Lbs.)	-
ORC Module	11 N.m (8 Ft. Lbs.)	-
PARK ASSIST MODULE TO BIW	3 N.m (26 In. Lbs.)	-
PCM to Bracket Bolts	8 N.m (71 In. Lbs.)	-
PCM to Bracket Nuts	8 N.m (71 In. Lbs.)	-
PCM Bracket to Body Bolts	6 N.m (53 In. Lbs.)	-
PCM Ground Wire Install	7 N.m (62 In. Lbs.)	-
PCM Ground Wire Nuts	9 N.m (82 In. Lbs.)	-
PDC to Wiring Connector	5 N.m (44 In. Lbs.)	-
PDC LOWER COVER Nuts	8 N.m (71 In. Lbs.)	-
Power Inverter Module Bracket to IP	8 N.m (71 In. Lbs.)	-
RFH Module to bracket	9 N.m (82 In. Lbs.)	-
Security Gateway Module to Speaker Enclosure	5 N.m (44 In. Lbs.)	-
Steering Column Control Module Band Clamp Screw	6 N.m (53 In. Lbs.)	-
Tire Pressure Monitoring (TPM) Module Bracket Nuts	7 N.m (62 In. Lbs.)	-

MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



NOTE: There is no internal service of the EHPS module. The EHPS module is integral to the EHPS pump (1). Replace the EHPS pump as an assembly, including the brackets, and EHPS module.

The EHPS pump is located in front of the right side tire and can be accessed by loosening and positioning aside the right front wheelhouse splash shield.

OPERATION

Multiple modules work together to improve vehicle steering assist at different rates at different speeds. At slow speeds (parking maneuvers) more assist is available and at high speeds less assist is available. The EHPS module uses the Controller Area Network-Chassis (CAN)-C data bus for inputs and outputs of the information necessary for operation. The use of a scan tool is necessary for diagnostics. EHPS module faults are stored in a diagnostic program memory and are accessible with the scan tool. Faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored faults are not erased if the battery is disconnected. For descriptions and procedures related to the appropriate Diagnostic Trouble Code (DTC). Refer to **DIAGNOSIS AND TESTING**.

The EHPS pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS pump draws power from the 12 volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The output flow of the EHPS Pump is varied as a function of steering wheel rate received from the Steering Angle Sensor (SAS) and vehicle speed received from Anti-Lock Brake System (ABS) module in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the vehicle speed message greater than 5 km/h (3 mph) is received on CAN-C. If the vehicle speed message is missing at vehicle startup, the EHPS Pump will not operate. If the vehicle speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the steering wheel position message is lost the EHPS Pump will use a default steering wheel rate of 230B°/sec to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

REMOVAL AND INSTALLATION

ELECTRIC-HYDRAULIC POWER STEERING (EHPS) MODULE

NOTE: There is no internal service of the Electro-Hydraulic Power Steering (EHPS) module. The EHPS module is integral to the EHPS pump. Replace the EHPS module as an assembly, including the brackets, and EHPS pump.

For replacement of the EHPS module. Refer to **PUMP, REMOVAL AND INSTALLATION**.

MODULE, ELECTRONIC SHIFT (ESM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Electronic Shifter Module (ESM) is part of the shifter assembly called the E-Shifter (1). The E-Shifter is an electronic Shift-by-Wire device that is mounted to the vehicle sled. If it is necessary to service the ESM, the entire shifter must be replaced.

The shifter offers PRNDM+- modes of function. The M selection (Manual mode) is engaged by moving the shift-lever sideways to M. Requests to up/down shift are achieved by moving the lever fore/aft once in the manual position.

OPERATION

The shifter assembly incorporates an electronic control module called an ESM. The ESM communicates with the Transmission Control Module (TCM) and other modules on the Controller Area Network-Chassis (CAN-C) bus.

The ESM is connected to the vehicle wire harness with a single 12 way connector located at the shifter.

The ESM can set Diagnostic Trouble Codes (DTCs) when a fault is detected.

The ESM processes the up/downshift requests when operating in manual mode and communicates the request to the TCM.

The ESM incorporates a solenoid that allows the lever to be locked for purposes of Brake Transmission Shift Interlock (BTSI) function.

The ESM contains a lever-lock function that is controlled electronically by the TCM via CAN message, and mechanically by the release trigger on the knob.

Indication of selected/non-selected gears is provided via illumination of PRNDM+- characters adjacent to the shift knob.

Lever-position feedback is provided via mechanical detents, which also keep the lever in the position it is placed in.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The Electronic Shift Module (ESM) is integrated into the transmission shifter assembly. If it is necessary to remove the ESM, remove the transmission shifter assembly. Refer to [8HP50/850RE, SHIFTER, TRANSMISSION, REMOVAL AND INSTALLATION](#) [8HP75, SHIFTER, TRANSMISSION, REMOVAL AND INSTALLATION](#) .

NOTE: If the ESM is being replaced, the "Restore Vehicle Configuration" routine must be performed. Using the diagnostic scan tool, navigate to the BCM Misc

Functions menu to select and perform this routine.

MODULE, ELECTRONIC STEERING LOCK (ESL)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION



DESCRIPTION

Vehicles manufactured for Europe-Middle East-Africa (EMEA) markets only have an electromechanical device called an Electronic Steering Lock (ESL) (1) that locks (Ignition OFF) and unlocks (Ignition ON) the steering when requested by the Body Control Module (BCM) with a valid key present in the vehicle. The ESL module is located and secured to the top of the steering column and deploys a lock bolt to lock the steering column.

The ESL module transmits data and communicates with the other modules involved in the Sentry Key Immobilizer System (SKIS) via Controller Area Network-Chassis (CAN-C).

OPERATION

Steering Column Locking

Before sending the steering locking request to the ESL module, the BCM checks the following parameters:

- Ignition status: the transition from "Ignition ON" to "Ignition OFF" must be detected. The Key signal is used although the vehicle is equipped with a push button ignition system.
- For versions with automatic transmission only. Automatic transmission status: the transmission must be in Park **P**.

If any of the conditions are not satisfied, the BCM will not send the steering column locking request to the ESL module.

If the vehicle has a manual gearbox, the BCM will only check the first two parameters. If satisfied, the ESL module will lock the steering column when the vehicle speed is below a minimum threshold and the ignition status is OFF.

The ESL module receives the Vehicle Speed Signal (VSS) from the Antilock Brake System (ABS) module. The acquisition of the VSS continues for some time after the ignition is turned to OFF.

Steering Column Unlocking

When the BCM receives the information that the Keyless Ignition Node (KIN) Stop/Start button has been pressed from the Radio Frequency Hub (RF-Hub), it requests that the RF-Hub carry out key recognition. If the key is identified as a valid key, the BCM will send a steering column unlocking request to the ESL module. If

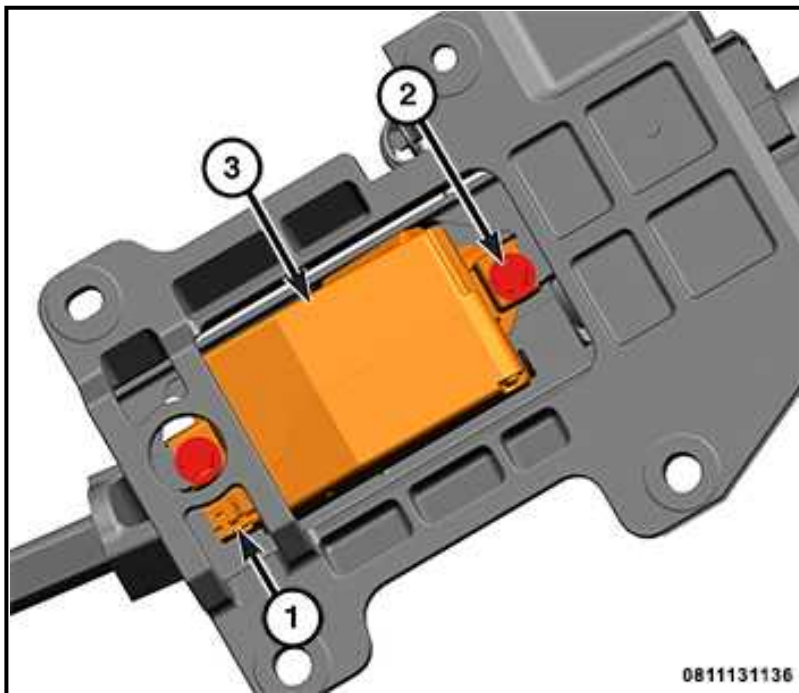
instead the key is identified as an invalid key or missing key, the BCM will not send any steering column unlocking request.

REMOVAL AND INSTALLATION

ELECTRONIC STEERING LOCK (ESL) MODULE

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Lower the steering column enough to access to the Electronic Steering Lock (ESL) module. Refer to [COLUMN, REMOVAL AND INSTALLATION](#) .



1 - ESL Module Wire Harness Connector
2 - Electronic Steering Lock (ESL) Module Bolts
3 - ESL Module

3. Disconnect the ESL module wire harness connector.
4. Remove the two Electronic Steering Lock (ESL) module bolts.
5. Remove the ESL module.

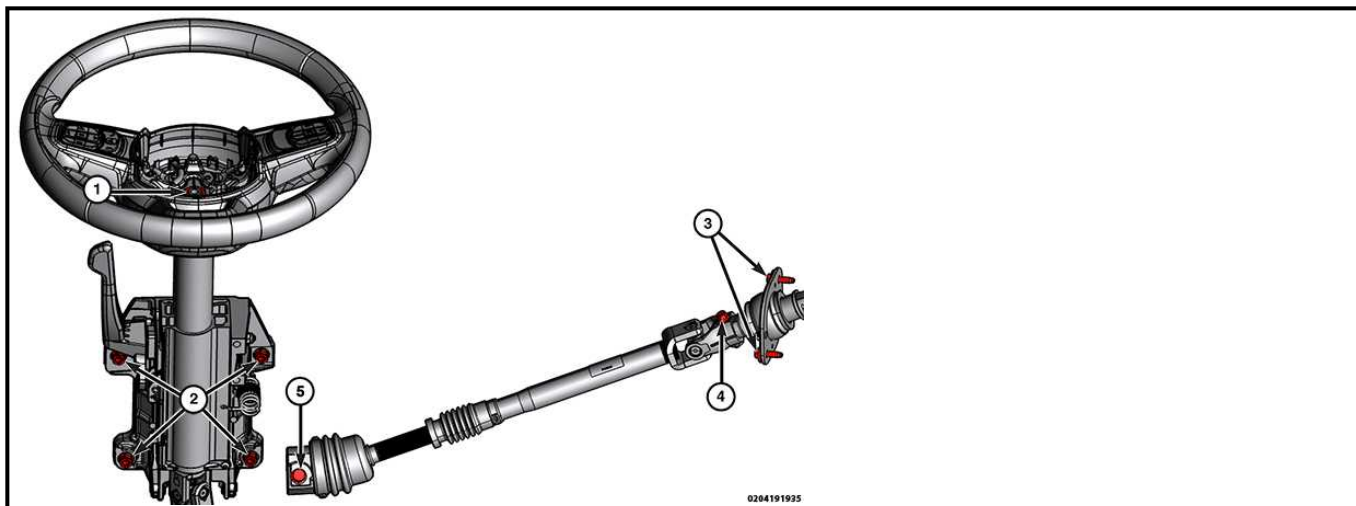
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

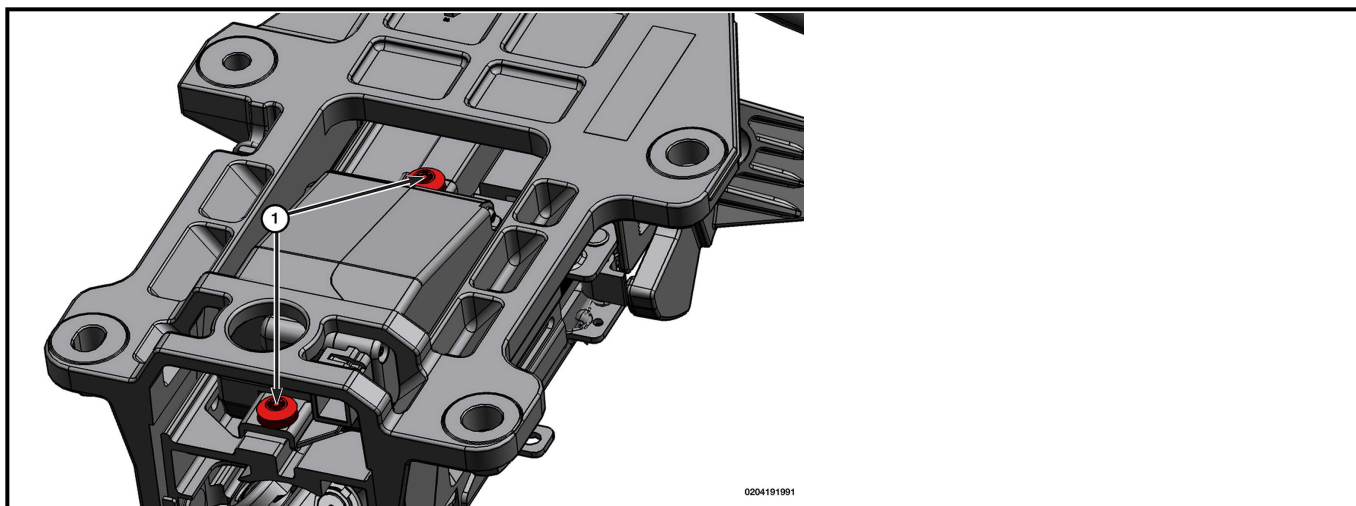
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

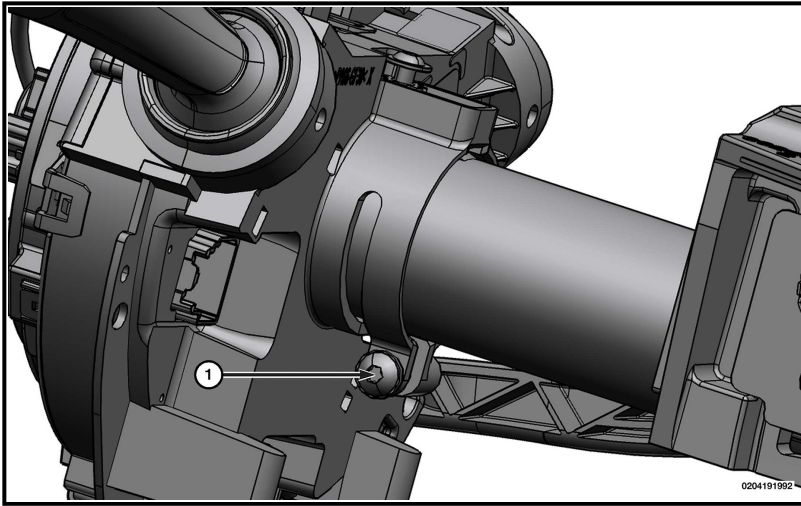
STEERING COLUMN



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Steering Wheel Nut	50 N. m (37 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
2	Steering Column Nuts	27 N. m (20 Ft. Lbs.)	-
3	Bulkhead Bearing Bolt	9 N. m (7 Ft. Lbs.)	-
4	Intermediate Shaft Coupler Upper Pinch Bolts	34 N. m (25 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
5	Intermediate Shaft Coupler Lower Pinch Bolts	55 N. m (41 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Electronic Steering Lock (ESL) Module Bolts	8 N. m (71 In. Lbs.)	-



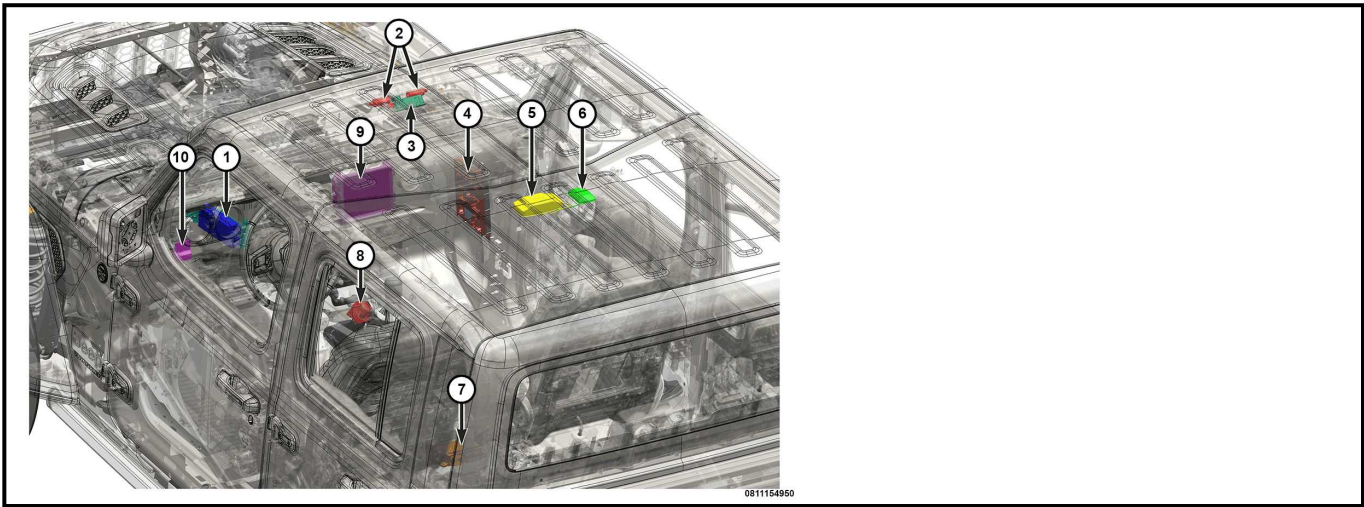
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Steering Column Control Module (SCCM) Band Clamp Fastener	6 N. m (53 In. Lbs.)	-

MODULE, GLOBAL TELEMATICS BOX

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Global Telematics Box Module (TBM2) system consists of the following components:

COMPONENT INDEX

1.	Refer to <u>GLOBAL TELEMATICS BOX MODULE (TBM2).</u>
2.	Refer to <u>MICROPHONES.</u>
3.	Refer to <u>SOS/ASSIST CALL BUTTONS.</u>
4.	Refer to <u>BODY CONTROL MODULE (BCM).</u>
5.	Refer to <u>LONG TERM EVOLUTION 1 (LTE1) ANTENNA.</u>
6.	Refer to <u>GLOBAL POSITIONING SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA.</u>
7.	Refer to <u>OCCUPANT RESTRAINT CONTROLLER (ORC).</u>
8.	Refer to <u>ECALL SPEAKER.</u>
9.	Refer to <u>RADIO.</u>

A telematics connectivity module, called the TBM2, is located on the right inner side of the steering column support on left hand drive vehicles, and on the left inner side of the steering column support on right hand drive vehicles. It is part of the emergency crash notification system, which is included in the vehicle to automatically initiate an audio emergency call (eCall) to a Public Safety Answering Point (PSAP), either as an option or as standard equipment in markets that require it and are not connected to the GLONASS Emergency Response Assist System. An eCall can be manually triggered by the vehicle occupant if so desired. When triggered, whether automatically or manually, the vehicle eCall system will also attempt to send a Minimum Set of Data (MSD) to a public Mobile Network Operator (MNO) concerning the vehicle location and Vehicle Identification Number (VIN).

In addition, other features are included in the telematics connectivity system to enhance the customer experience through interaction with the vehicle and is dependent on the market for which the vehicle is manufactured. Several applications are available, some required by government regulations, and communicate with the Global Services Delivery Platform (GSDP) in that market.

OPERATION

NOTE: **The Security Gateway Module (SGW) is the Controller Area Network (CAN) gateway between the radio, telematics modules, Data Link Connector (DLC) and the other vehicle CAN modules. An SGW failure could prevent the radio from powering up, telematics module from communicating or a scan tool from communicating with the vehicle. For additional information on the SGW, Refer to MODULE, SECURITY GATEWAY (SGW), DESCRIPTION AND OPERATION.**

The TBM2 system will detect an eCall trigger, whether automatic through a crash severe enough or manual at a vehicle occupant's request by pressing the SOS button. Once triggered, the system will attempt to send an MSD to any public system operated by an MNO and also attempt to establish a voice connection between the vehicle and the PSAP. When connected to the MNO, the vehicle will transfer the vehicle location and VIN.

The TBM2 system is triggered automatically when the ORC sends a signal using the CAN - Chassis (CAN-C) data bus or the Output Digital Serial line. The Output Digital Serial line is only used in markets that require the TBM2 system. The severity of the crash will determine if an eCall is sent or not. This will include direction of the impact, whether frontal, side, rear or rollover.

The TBM2 system can be manually triggered using the SOS button by the vehicle driver or a passenger. The TBM2 will actuate the system in the same manner as if it had been triggered automatically by the ORC. When eCall is in operation, the radio audio will be muted and eCall audio will be heard through the eCall speaker.

In the event that the vehicle battery connection is compromised, a backup battery is mounted within the TBM2 to ensure the integrity of the system and a continuation of an eCall if the vehicle battery becomes disconnected while a call is in progress. If the backup battery becomes discharged, a message will be indicated in the Instrument Panel Cluster (IPC) and a diagnostic code set in the TBM2.

The TBM2 microcontroller continuously monitors all of the TBM2 system electrical circuits to determine the system readiness. If the TBM2 detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the IPC and BCM over the CAN data bus to turn ON the TBM2 indicator. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition cycle, while a stored fault causes a DTC to be stored in memory by the TBM2.

The SGW is in the audio and telematics CAN systems to provide security against certain types of attacks and threats from the scan tool, telematics and entertainment buses, which can put the rest of the vehicle's buses at risk of intrusion. The SGW lies electrically between the vehicle on one side, and the DLC, telematics and entertainment systems on the other side. The main function is to gate messages from one bus to another. The SGW monitors the B(+) Feed, switched ignition feed, CAN circuits, software and hardware for any concerns.

The hardwired inputs and outputs for the TBM2 may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the TBM2 or the electronic controls and communication between other modules and devices that provide some features of the TBM2 system. The most reliable, efficient and accurate means to diagnose the TBM2 or the electronic controls and communication related to TBM2 system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

Modes of Operation

- **ON Mode**

- Ignition switch status is not considered if ignition OFF timer has not ended
- Assist/SOS buttons are armed
- CAN is active
- All TBM2 systems are active

ON Mode deactivated and mode changes to Power OFF Mode under the following conditions:

- Battery is disconnected
- Monitoring time expires - TBM2 stores the previous state

- **Sleep Mode**

- Ignition switch is OFF
- CAN is not active
- Assist/SOS buttons are disarmed
- TBM2 is in low power mode
- Radio is OFF

Sleep Mode deactivated and mode changes to ON Mode under any of the following conditions:

- Battery is connected

Sleep Mode deactivated and mode changes to Power OFF Mode when all of the following conditions have been met:

- Battery is disconnected
- Monitoring time expires - TBM2 stores the previous state

- **Emergency/Assist Call Mode**

- Battery is connected
- Assist/SOS buttons are armed and one or the other is pressed
- CAN is active
- E-Call/Assist is active

Emergency/Assist Call Mode deactivated and mode changes to ON Mode under the following conditions:

- E-Call/Assist call procedure ends via USB enabling

Emergency/Assist Call Mode deactivated and mode changes to Power OFF Mode under the following conditions:

- E-Call/Assist call procedure ends by user and the battery is disconnected

- **Power Off Mode**

- Battery disconnected
- Assist/SOS buttons disarmed

- Monitoring time has expired

Power OFF Mode deactivated and mode changes to ON Mode under the following conditions:

- Battery is connected

Power OFF Mode deactivated and mode changes to Logistic Mode when all of the following conditions have been met:

- Battery is connected
- Previous Logistic session is active
- **Logistic Mode**
 - Assist/SOS buttons disarmed
 - Telematic services not available
 - Logistic status is set to active

Logistic Mode deactivated and mode changes to ON Mode under the following conditions:

- Vehicle starts moving
- Ignition OFF event occurs

Logistic Mode deactivated and mode changes to Power OFF Mode when all of the following conditions have been met:

- Battery is disconnected
- Monitoring time expires - TBM2 stores the previous state
- **Test Mode**
 - Ignition is ON
 - Tester is present
 - Diagnostic session is active
 - CAN transceivers are active
 - Fake test calls available
 - Test telematic services are available

Test Mode deactivated and mode changes to ON Mode under any of the following conditions:

- Test sequence is completed
- Vehicle starts moving
- Ignition OFF event occurs

Test Mode deactivated and mode changes to Power OFF Mode when all of the following conditions have been met:

- Battery is disconnected
- Monitoring time expires - TBM2 stores the previous state
- **Maintenance Mode**
 - Assist/SOS buttons disarmed
 - Ignition is ON
 - Phone calls are disabled
 - CAN transceivers are active
 - Vehicle is in assistance garage - not moving

Maintenance Mode deactivated and mode changes to ON Mode under any of the following conditions:

- Diagnostic session is no longer detected
- Vehicle starts moving
- Ignition OFF event occurs

Maintenance Mode deactivated and mode changes to Power OFF Mode when all of the following conditions have been met:

- Battery is disconnected
- Monitoring time expires - TBM2 stores the previous state

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

Inputs

- eCall status from TBM2
- vehicle data

Outputs

- ignition status
- Daytime mode

ECALL SPEAKER

ECALL SPEAKER

Refer to [**COMPONENT INDEX**](#).

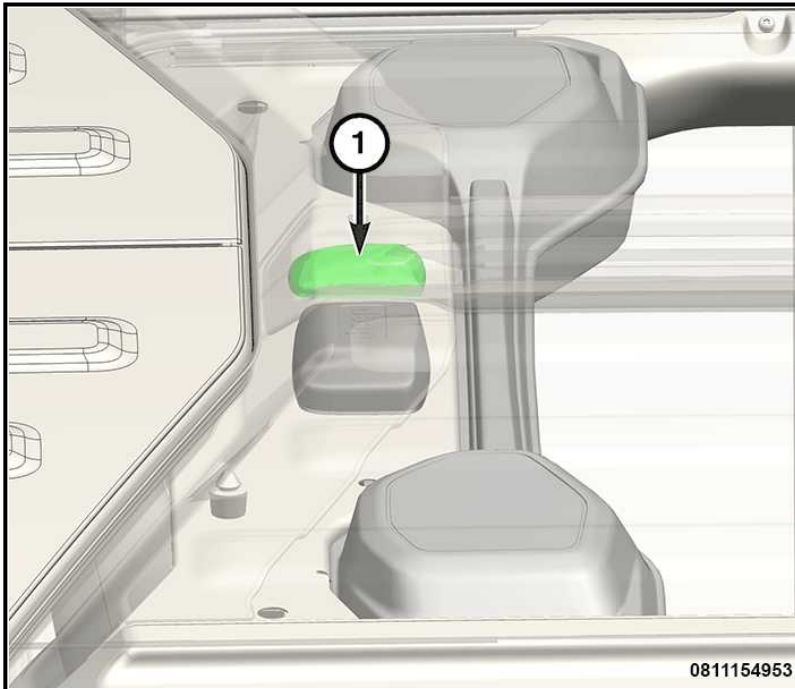


The eCall system uses a single dedicated 70 mm speaker (1), in markets that require the TBM2 system, for vocal communication with the vehicle occupants during an eCall. The speaker is located at the front of the center console where the instrument panel meets the center console. It is mounted to the instrument panel by two screws and connected directly to the TBM2 via the wiring harness.

GLOBAL POSITIONING SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA

GLOBAL POSITIONING SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA

Refer to [COMPONENT INDEX](#).



The GPS/SDARS antenna (1) allows the MNO to locate the vehicle in the event the occupant cannot respond with the vehicle location.

GLOBAL TELEMATICS BOX MODULE (TBM2)

GLOBAL TELEMATICS BOX MODULE (TBM2)

Refer to [COMPONENT INDEX](#).

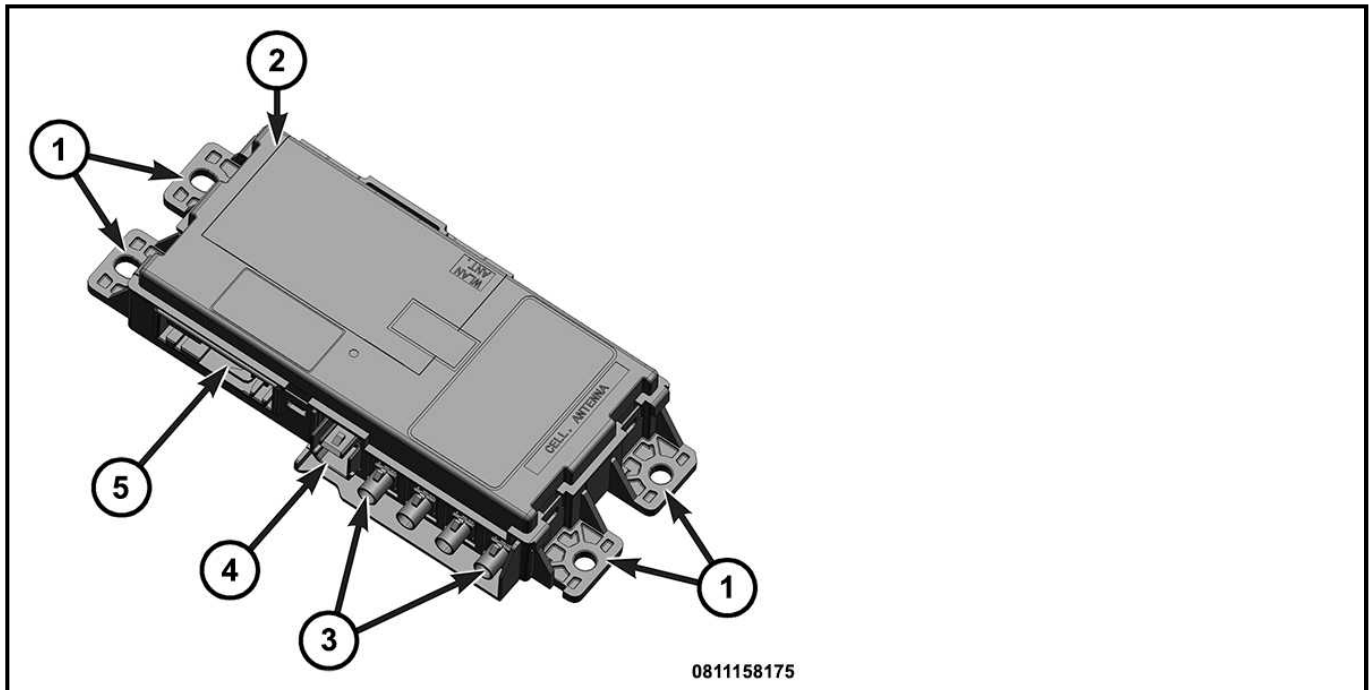
Inputs

- global positioning information
- emergency (SOS) button pressure status
- ORC module data
- ignition status from the BCM
- microphone data
- vehicle configuration
- Supplemental Restraint System (SRS) indicator status from the IPC
- Daytime mode from the BCM
- language from the IPC
- crash event data

Outputs

- phone communication to the eCall speaker
- global positioning information to the cell phone module
- vehicle data to the BCM
- eCall status to the BCM
- audio mute
- illumination of the SOS button Light Emitting Diode (LED)

- power and ground to the SOS button

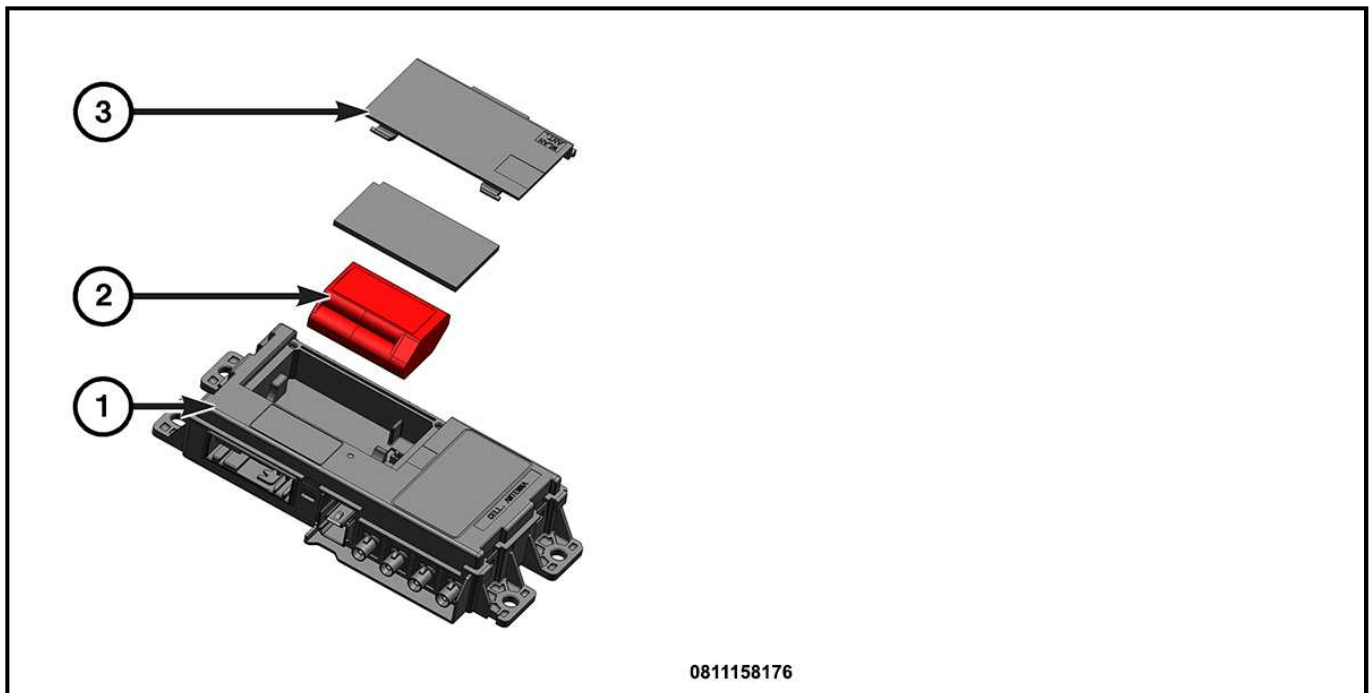


The TBM2 (2) is the solid state control module in the eCall system and is located on the right inner side of the steering column support on left hand drive vehicles, and on the left inner side of the steering column support on right hand drive vehicles.

The TBM2 (2) is connected to the instrument panel wiring harness using one 32-pin wiring harness connector (5) and four antenna connectors (3). The Universal Serial Bus (USB) (4) is connected between the radio and TBM2 for connectivity to the TBM2 internal Wi-Fi antenna. Three of the antenna connectors make connections to the GPS/SDARS antenna for GPS data, the LTE1 antenna and LTE2 antenna for communication on the 4G cellular network, if available in the market. The fourth antenna connection is a pass-through for GPS data to the radio.

The TBM2 module is mounted to the instrument panel structural support using two bolts to secure the two rear mounting bosses (1). The other two mounting bosses (1) are held in place by the TBM2 bracket using a slip-in pressure fit at the front of the bracket.

The TBM2 has an internal cell phone antenna which is used in the event of the vehicle's cell phone module not operating or not operating properly.

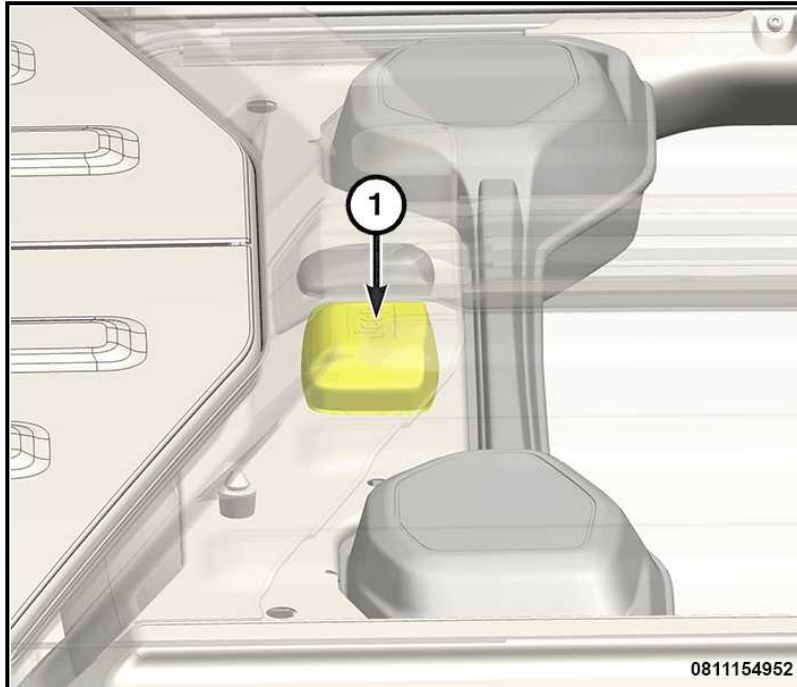


The TBM2 incorporates a backup battery (2) with a life expectancy of 5-7 years that will allow the eCall system to continue to work in case of vehicle power interruption. The battery will allow call and data transfer for at least 15 minutes with callback capability for at least one hour after a vehicle emergency.

LONG TERM EVOLUTION 1 (LTE1) ANTENNA

LONG TERM EVOLUTION 1 (LTE1) ANTENNA

Refer to [COMPONENT INDEX](#).



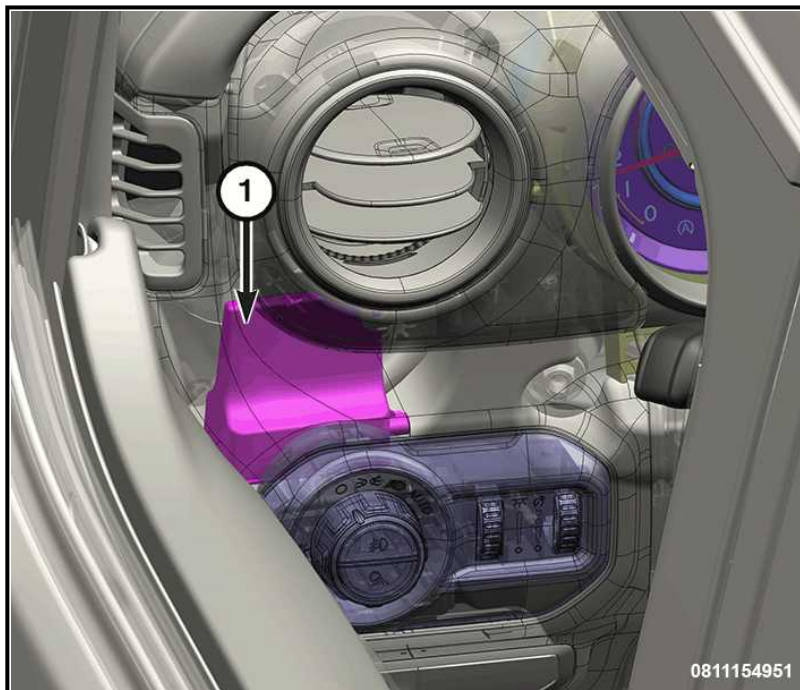
The vehicle is equipped with two cellular phone antennas. The LTE1 antenna (1) is used for sending and receiving cellular telephone signals and data. The signals and data are supplied to the radio and telematics modules.

The LTE1 antenna is mounted in the center of the middle sports bar, to the left of the GPS/SDARS antenna (if equipped). The use of two LTE antennas is for the purpose of increasing data upload and download speeds.

LONG TERM EVOLUTION 2 (LTE2) ANTENNA

LONG TERM EVOLUTION 2 (LTE2) ANTENNA

Refer to [COMPONENT INDEX](#).



The second cellular telephone antenna is the LTE2 antenna (1) and is used for sending and receiving cellular telephone signals and data. The signals and data are supplied to the radio and telematics modules.

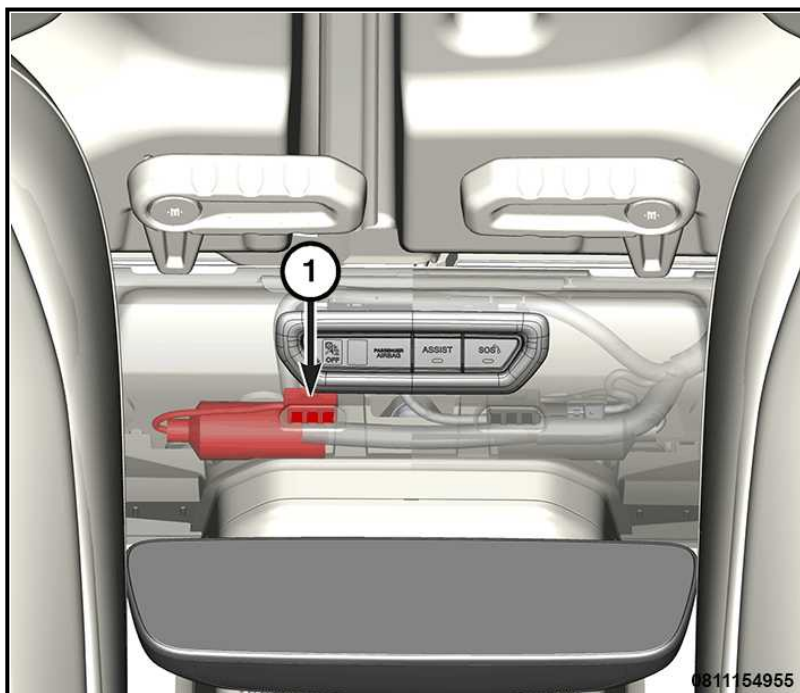
The LTE2 antenna is mounted in the instrument panel, behind the headlamp switch. The use of two LTE antennas is for the purpose of increasing data upload and download speeds.

The LTE2 antenna has an internal 10 kilohm resistor to set a Diagnostic Trouble Code (DTC) in the module to which it is connected if the antenna cable or LTE2 antenna is disconnected from that module.

MICROPHONES

MICROPHONES

Refer to [COMPONENT INDEX](#).



Two stereo microphones are in the upper windshield header trim just above the rearview mirror centered between the sun visors on the windshield. However, only the left microphone (1) is used in the TBM2 system. In markets that require the TBM2 system, the left microphone is connected directly to the TBM2, but in markets where it is optional equipment, the microphone is connected to the radio. When the left microphone is connected directly to the TBM2, the TBM2 also acts as a pass-through for the left microphone signal to the radio for use in the UconnectB® hands free system.

OCCUPANT RESTRAINT CONTROLLER (ORC)

OCCUPANT RESTRAINT CONTROLLER (ORC)

Refer to [COMPONENT INDEX](#).

The TBM2 system is triggered automatically when the ORC sends a signal using the CAN-C data bus or the Output Digital Serial line. The Output Digital Serial line is only used in markets that require the TBM2 system. The severity of the crash will determine if an eCall is sent or not. This will include direction of the impact, whether frontal, side, rear or rollover.

RADIO

RADIO

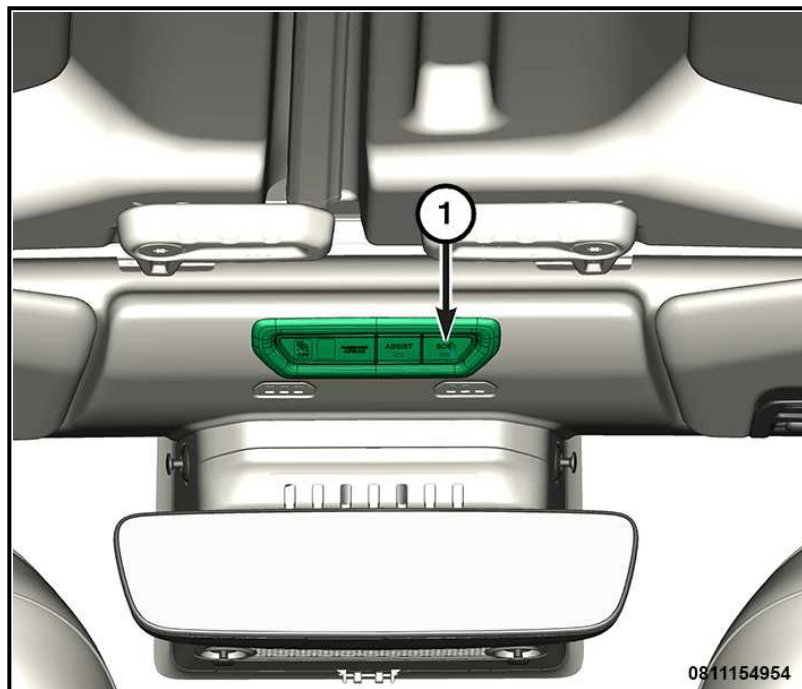
Refer to [COMPONENT INDEX](#).

When eCall is in operation, the radio audio will be muted and eCall audio will be heard through the eCall speaker.

SOS/ASSIST CALL BUTTONS

SOS/ASSIST CALL BUTTONS

Refer to [COMPONENT INDEX](#).



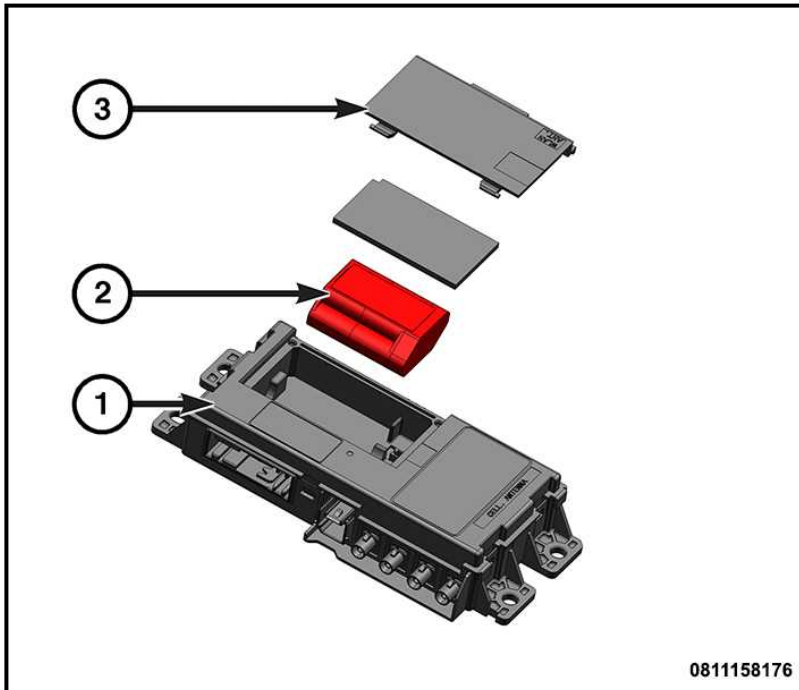
The TBM2 system can be manually triggered using the SOS button by the vehicle driver or a passenger. The TBM2 will actuate the system in the same manner as if it had been triggered automatically by the ORC. When eCall is in operation, the radio audio will be muted and eCall audio will be heard through the eCall speaker, in markets where the TBM2 system is required, or through the audio system speakers in markets where the TBM2 system is optional. The microphone data is sent to the TBM2 for broadcast to the PSAP.

REMOVAL AND INSTALLATION

BACKUP BATTERY

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the Global Telematics Box Module (TBM2). Refer to [MODULE, GLOBAL TELEMATICS BOX, REMOVAL AND INSTALLATION](#).



3. Remove the TBM2 backup battery cover (3) from the TBM2 (1).
4. Gently pull the backup battery (2) from the TBM2 (1) and disconnect the negative battery wire connector, then disconnect the positive battery wire connector.

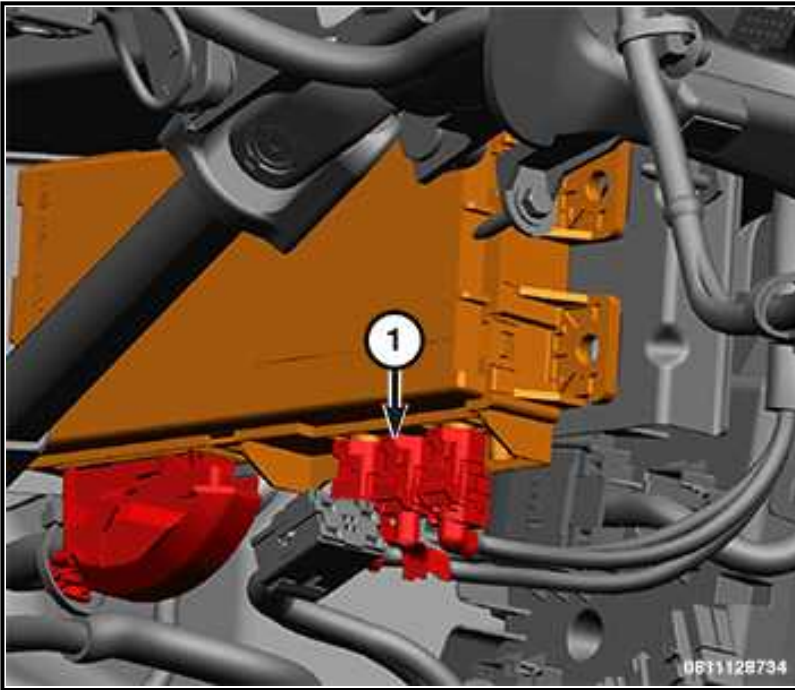
INSTALLATION

1. Position the backup battery to the TBM2.
2. Connect the positive battery connector first, then connect the negative battery connector.
3. Gently insert the backup battery into the TBM2.
4. Install the backup battery cover.
5. Install the TBM2. Refer to [MODULE, GLOBAL TELEMATICS BOX, REMOVAL AND INSTALLATION](#).
6. Connect the negative battery cable(s). Refer to the appropriate service information .

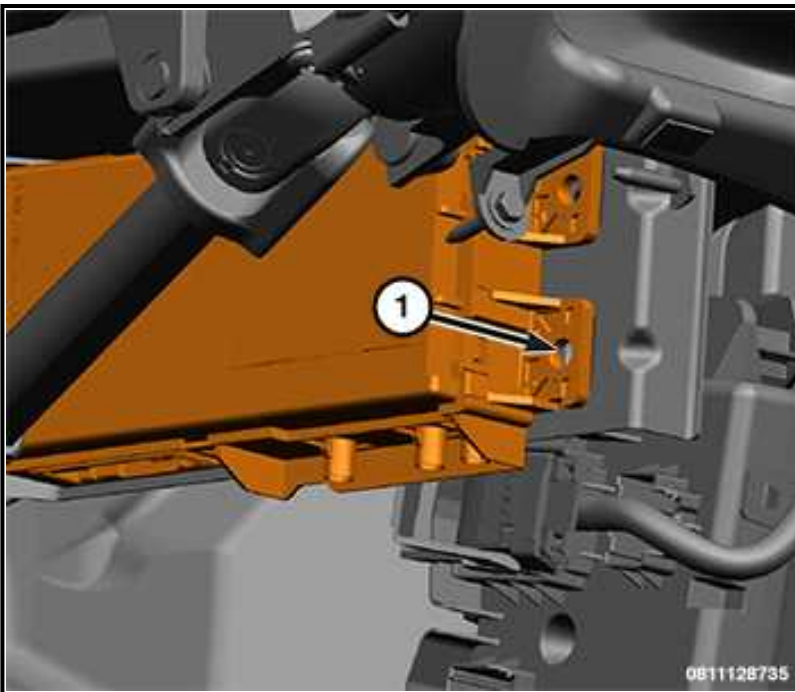
GLOBAL TELEMATICS BOX MODULE

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connectors from the Global Telematics Box Module (TBM2).



4. Remove the two fasteners (1) from the TBM2 that secure the TBM2 to the bracket.

5. Remove the TBM2 from the vehicle.

INSTALLATION

1. Position the TBM2 to the TBM2 mounting bracket.

2. Install the two fasteners for the TBM2 bracket and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

3. Connect the TBM2 wire harness connectors.

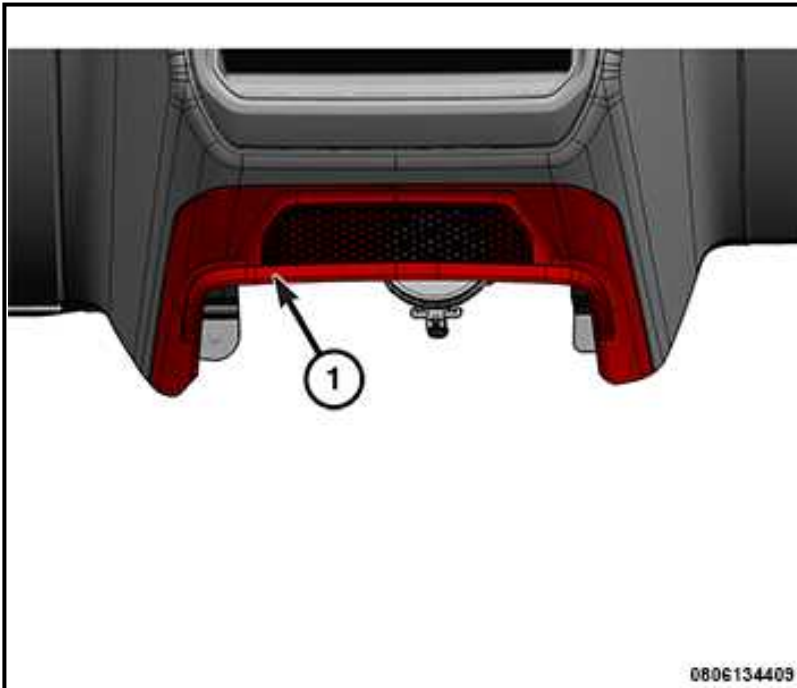
4. Install the steering column opening cover. Refer to [COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION](#) .

5. Connect the negative battery cable(s). Refer to the appropriate service information .

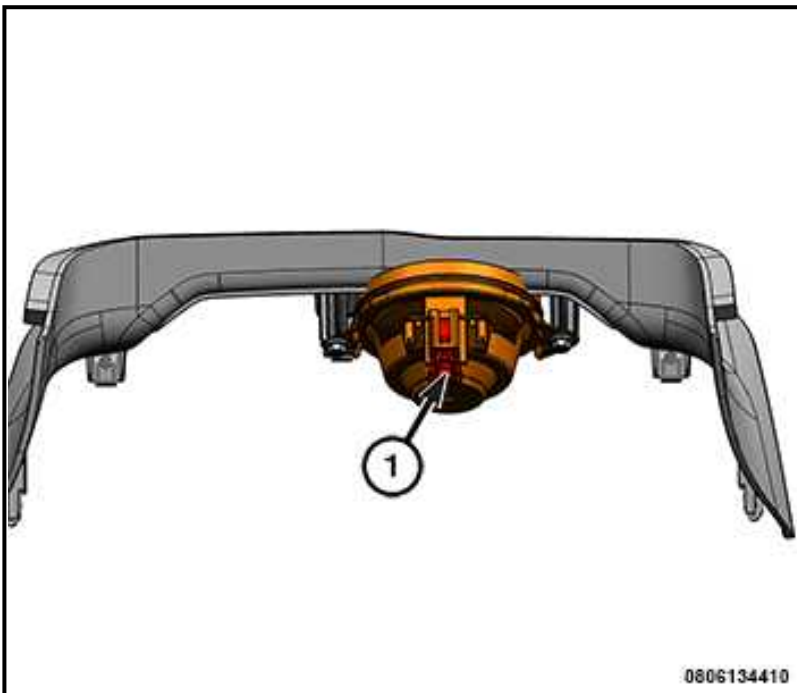
SPEAKER

REMOVAL

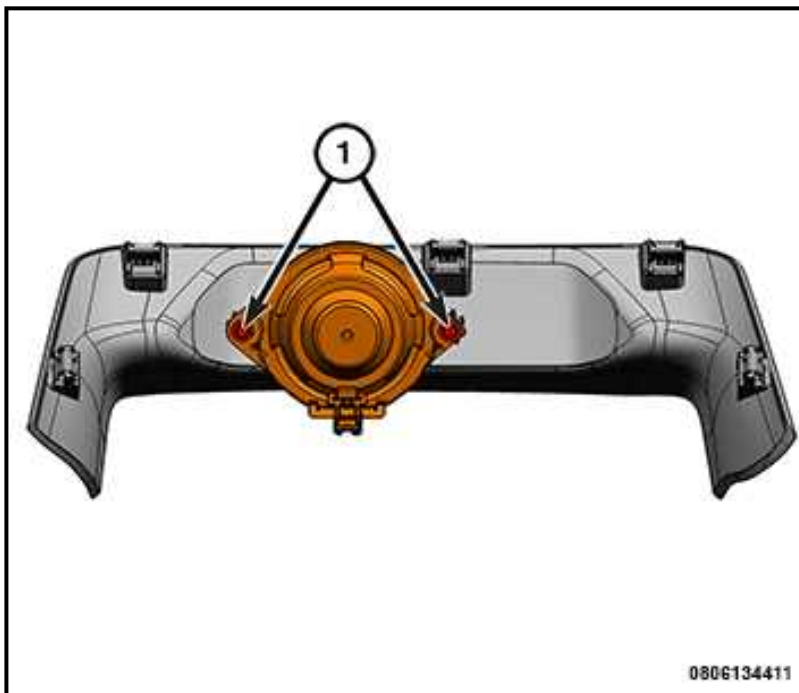
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the floor console. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#)
[CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .



3. Remove the lower instrument panel closeout panel (1) from the instrument panel.



4. Disconnect the instrument panel wiring harness connector (1) from the eCall speaker.



5. Remove the two fasteners (1) from the eCall speaker that secure the speaker to the panel.
6. Remove the eCall speaker from the vehicle.

INSTALLATION

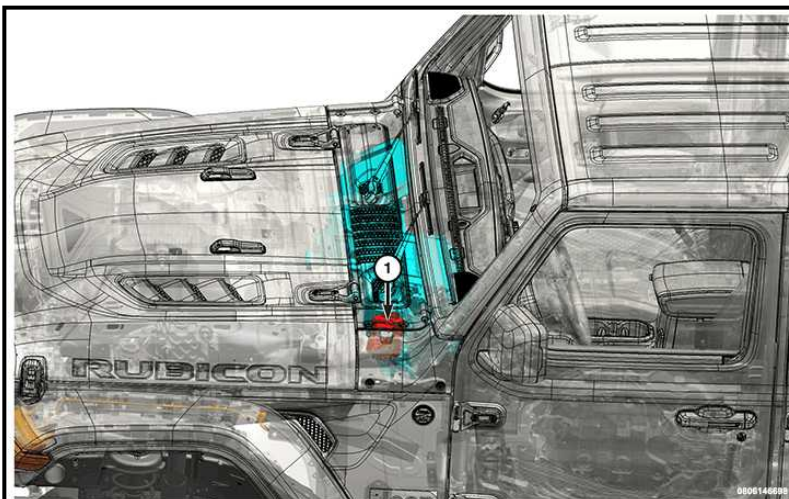
1. Position the eCall speaker close to the panel.
2. Install and tighten the two fasteners for the eCall speaker. Tighten the fasteners securely.
3. Connect the instrument panel wire harness connectors.
4. Install the lower instrument panel closeout panel to the instrument panel.
5. Install the floor console. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#)
[CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .
6. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE, HVAC

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Heating, Ventilation and Air Conditioning (HVAC) module is a microcontroller designed to operate the heating and A/C system, using the Controller Area Network - Interior High Speed (CAN-IHS) data bus. The HVAC module has a plastic housing with two wire harness connector receptacles, one mounting screw hole and two locating tabs. The 36-pin wire harness connector contains the circuits for power and ground, the controls on the HVAC housing and the A/C heater control, and CAN-IHS circuits that connect the HVAC module to the other modules in the vehicle. The 8-pin connector contains the sun and in-car temperature sensor circuits.

The HVAC module is mounted to the left side of the HVAC housing, above the accelerator pedal.

OPERATION

The HVAC module utilizes integrated circuitry and information carried over the CAN-IHS data bus to monitor many sensors and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the HVAC module allows it to control electronic functions and features of the heating and A/C system.

Some of the inputs received by the HVAC module over the CAN-IHS bus are as follows:

- A/C Request
- Ambient Air Temperature
- Electric Back Light (EBL) Request
- Electrical System Voltage
- Engine Coolant Temperature
- Engine Speed
- Refrigerant Pressure
- Vehicle Identification Number (VIN)
- Vehicle Odometer

Some of the messages broadcast by the HVAC module on the CAN-IHS bus are as follows:

- A/C Clutch Engage
- Auto Headlamp Signal
- EBL Status

The HVAC module receives the following information over hard wired circuits:

- Auto Headlamp Signal
- Evaporator Temperature
- Interior Air Temperature
- Left and Right Sun Load

The HVAC module monitors and controls the following over hard wired circuits:

- Driver and Passenger Blend Door Positions
- Blower Motor Speed
- Mode Door Position
- Recirculation Door Position

The HVAC module is diagnosed using a scan tool. Prior to replacing an HVAC module, run the calibration procedure to verify that the concern is not an air door calibration issue. With the scan tool, perform the HVAC Actuator Calibration Test.

The HVAC module cannot be adjusted or repaired and must be replaced if inoperative or damaged.

Refer to the Heating and Air Conditioning Description and Operation for additional information. Refer to [DESCRIPTION AND OPERATION](#) .

REMOVAL AND INSTALLATION

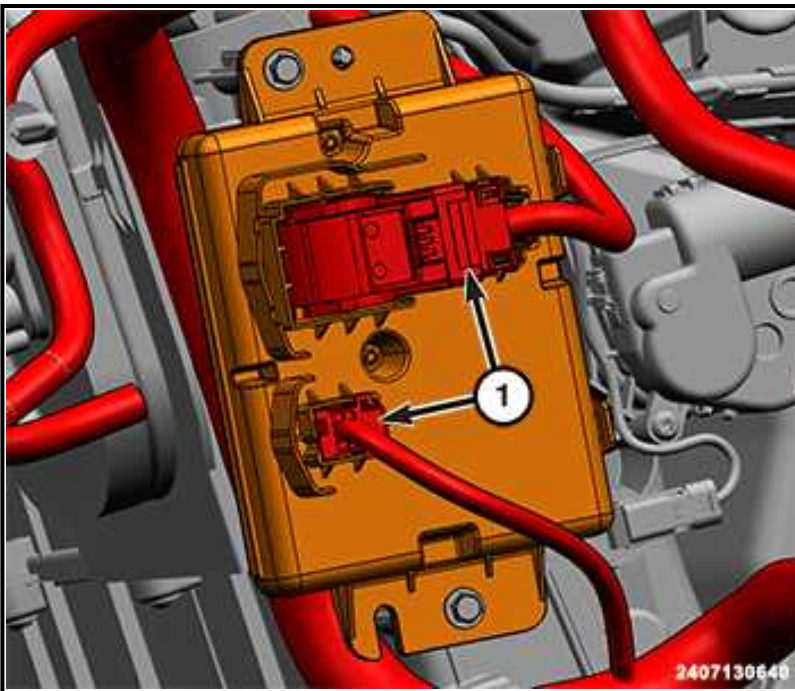
REMOVAL AND INSTALLATION

REMOVAL

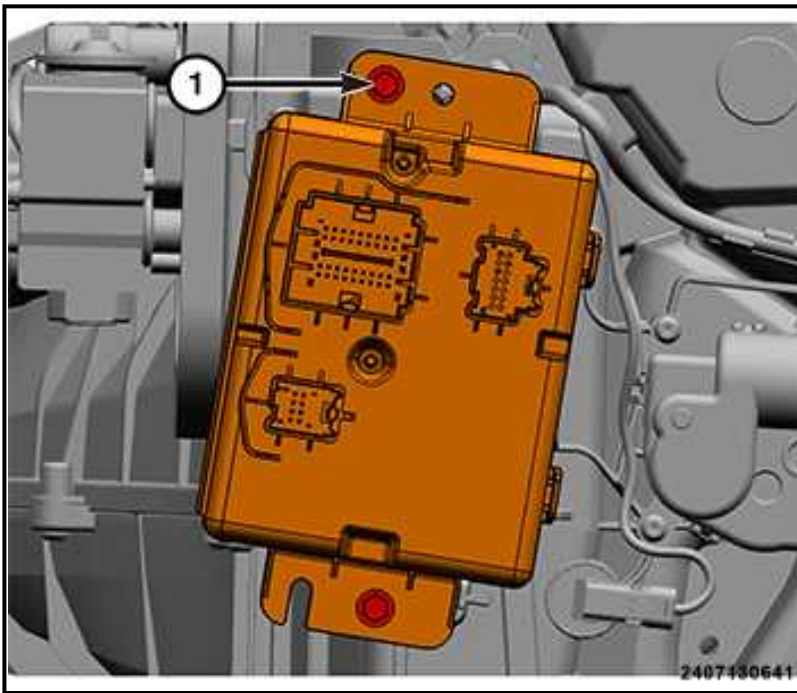
WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

NOTE: Illustration shown with instrument panel removed from view for clarity.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Lower the steering column. Refer to [COLUMN, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connectors (1) from the Heating, Ventilation, and Air Conditioning (HVAC) module.



4. Remove the fasteners (1) that secures the HVAC module to the housing.
5. Remove the HVAC module.

INSTALLATION

1. Position the HVAC module to the HVAC housing.
2. Install and tighten the fasteners that secures the HVAC module to the HVAC housing.
3. Connect the wire harness connector to the HVAC module.
4. Install the steering column. Refer to [COLUMN, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .
6. Using the diagnostic scan tool, the "Restore Vehicle Configuration" routine under the Body Control Modules (BCM) "Misc Functions" menu must be performed.

MODULE, INSTRUMENT PANEL CLUSTER (IPC)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

For the description and operation of the Instrument Panel Cluster (IPC). Refer to [DESCRIPTION AND OPERATION](#) .

REMOVAL AND INSTALLATION

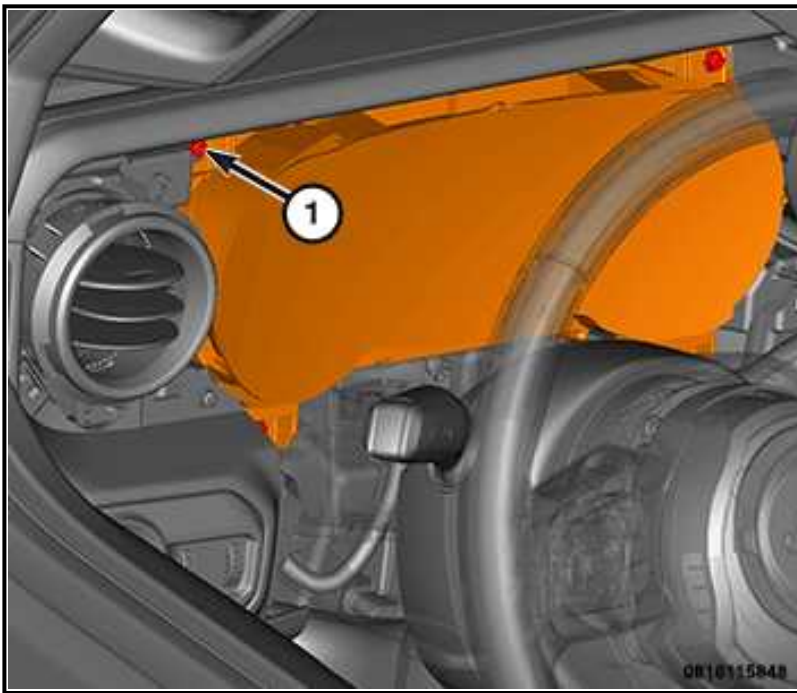
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the cluster bezel from the instrument panel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#) .

NOTE: Removal of the gap hider is not required.

3. Position the gap hider aside. Refer to [GAP HIDER, STEERING COLUMN SHROUD, REMOVAL AND INSTALLATION](#) .



4. Remove the fasteners (1) that secure the Instrument Panel Cluster (IPC) to the instrument panel armature.
5. Pull the top of the IPC rearward far enough to access and disconnect the instrument panel wire harness connectors from the back of the IPC housing.
6. Remove the IPC from the instrument panel.

INSTALLATION

1. Position the IPC close enough to the instrument panel to connect the wire harness connectors to the back of the IPC housing.
2. Position the IPC mounting tabs to the mounting holes in the instrument panel armature.
3. Install the fasteners that secure the mounting tabs of the IPC and tighten securely.
4. Install the gap hider. Refer to [GAP HIDER, STEERING COLUMN SHROUD, REMOVAL AND INSTALLATION](#).
5. Install the IPC bezel onto the instrument panel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#).
6. Connect the negative battery cable(s). Refer to the appropriate service information.

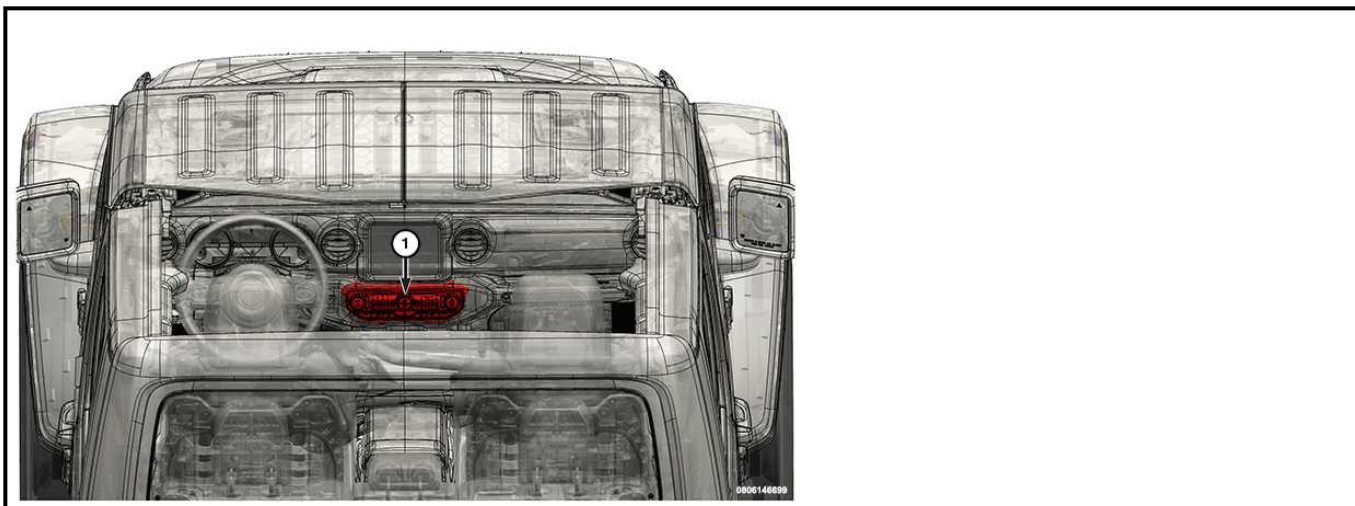
NOTE: Certain indicators in this IPC are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If a problem is noted that involves improper illumination of an indicator, disconnect and isolate the battery negative cable. After about five minutes, connect the battery negative cable and cycle the ignition to the ON position. The IPC should automatically relearn the equipment in the vehicle and properly configure the indicators.

MODULE, INTEGRATED CENTER STACK (ICSM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Integrated Center Stack (ICS) module (1) is located below the radio in the lower center stack panel.

OPERATION

This ICS module is available in multiple configurations, which vary depending upon the equipment in the vehicle. The ICS module allows manual control of the multiple vehicle systems. The ICS module communicates on the Controller Area Network - Interior High Speed (CAN-IHS) data bus and controls all connected vehicle systems via CAN messages.

The switch housing and the push buttons are constructed of molded plastic. Each push button has a smooth finish and is clearly identified with the appropriate text and International Control and Display Symbol icons. Several of the push buttons feature Light Emitting Diode (LED) units to give the vehicle operator an indication when the function of that switch is currently active. The back of the switch housing has an integral connector receptacle containing terminal pins that connect the switch to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness. Panel lamps dimmer controlled illumination lamps integral to the circuit board within the switch provide back lighting for visibility at night.



1. Manual Temperature Control (MTC) ICS
2. Automatic Temperature Control (ATC) ICS

The ICS module is the user interface for many functions and features in the vehicle.

The following features can be accessed through the ICS module as equipped:

- All radio functions
- Traction Control
- Parking Assist System (PAS)
- Climate Control System

- Front and Rear defroster
- Engine Stop/Start System
- Heated Seats
- Heated Steering Wheel
- Selec-Speed™ Control
- Audio MUTE
- Radio SCREEN OFF
- Hazard Switch

For additional information regarding each system the ICS module controls, refer to the section related to the feature.

The ICS module receives fused B+ from a fuse in the Power Distribution Center (PDC) and ground through a connection at a ground stud behind the right kick panel.

The individual controls located in the ICS module cannot be adjusted or repaired. If any control on the ICS module or control indicator lamp is inoperative or damaged, the entire ICS module must be replaced. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION**.

The individual controls located in the radio touchscreen cannot be adjusted or repaired. If a radio touchscreen control or control indicator lamp is inoperative or damaged, the entire radio must be replaced. Refer to **RADIO, REMOVAL AND INSTALLATION**.

Prior to replacing an ICS module, check for any Diagnostic Trouble Codes (DTCs) related to the affected system, and run any related calibration procedures to verify that the concern is not a calibration issue. Refer to **STANDARD PROCEDURE** .

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



2. Using trim stick C-4755 or equivalent, remove the Integrated Center Stack (ICS) and upper instrument panel center trim from the instrument panel.



3. Disconnect the wire harness connector (3) from the ICS.
4. Disconnect the wire harness connector from the Keyless Ignition Node (KIN) (1).
5. Remove the fasteners (2) from the ICS to the upper instrument panel center trim.
6. Remove the ICS from the vehicle.

INSTALLATION

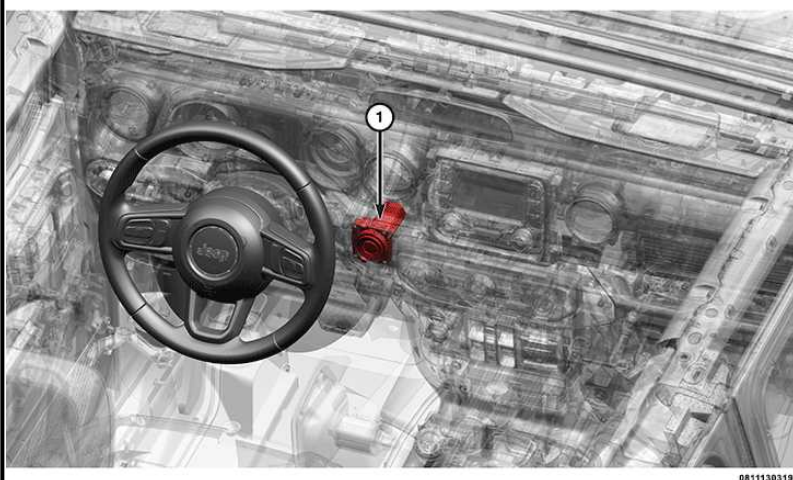
1. Position the ICS to the upper instrument panel center trim.
2. Install the fasteners for the ICS to the upper instrument panel center trim and tighten securely.
3. Connect the ICS wire harness connector.
4. Connect the KIN wire harness connector.
5. Install the ICS and upper instrument panel center trim.
6. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE, KEYLESS IGNITION NODE (KIN)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Keyless Ignition Node (KIN) (1) module contains the customer interface for ignition switch activation in the form of a momentary switch. Pressing the START/STOP button is the method of activation by the customer. The KIN is located in the instrument panel to the left of the center stack, encased and secured to the instrument panel. Fastener tabs built onto the housing of the KIN, latch into a grooved lip on the inner side of the instrument panel to secure it.

The KIN:

- Is used on the vehicles featuring "Keyless Go" system
- Is a slave module to the Radio Frequency Hub (RFH)
- Is primarily an Input/Output (I/O) device (A START/STOP button and ignition position indication)
- Contains a Low Frequency (LF) coil and other electronics to authenticate a key fob, in the event of default or a low key fob battery

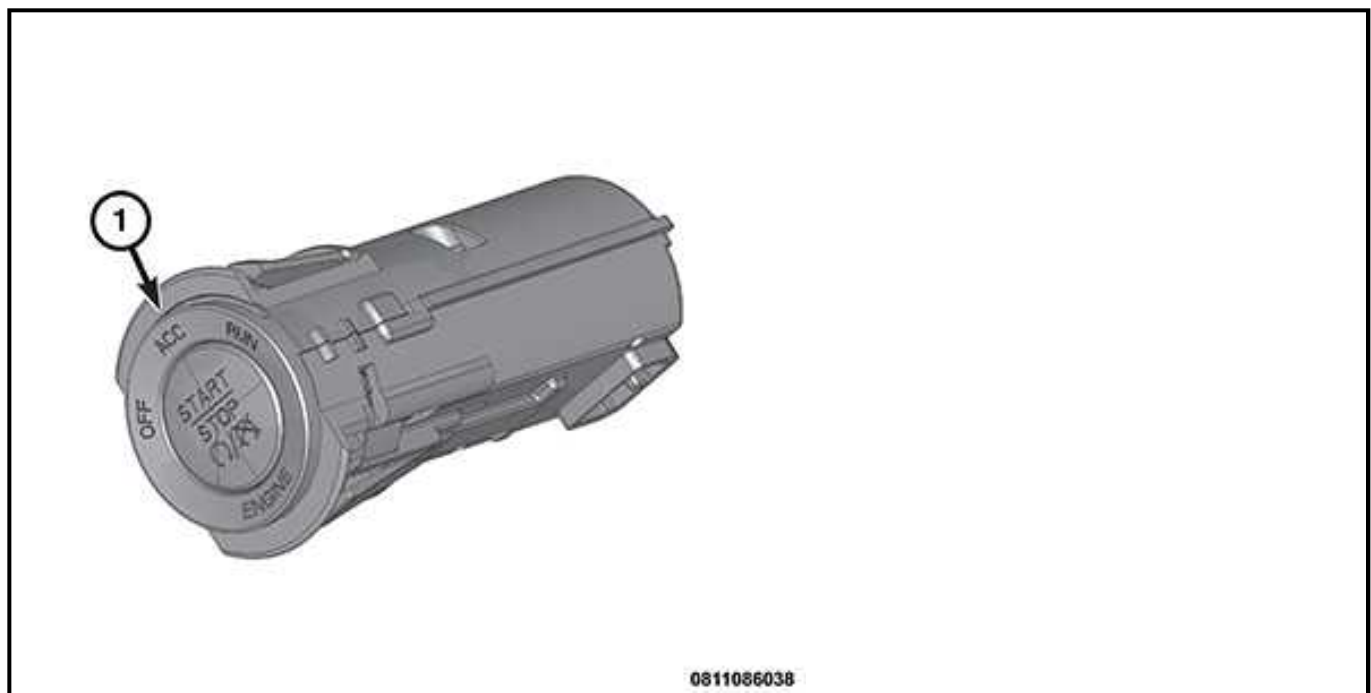
The KIN (START) processes:

- Press START/STOP button once = Transitions to ACCESSORY (ACC)
- Press START/STOP button again = Transitions to RUN
- Press START/STOP button again = Transitions to OFF
- Press START/STOP button once with the brake applied = Transition to START

The KIN contains four Light Emitting Diodes (LEDs) indicators:

- OFF
- ACC
- ON or RUN
- ENGINE START/STOP (center button backlight)

OPERATION



The KIN (1) replaces the conventional key and ignition switch with a momentary button press and a wireless electronic key fob. When the operator presses the GO-button the key fob is interrogated. If the key fob is recognized as to the vehicle and in the vehicles interior, the system will allow the ignition state of the vehicle to be changed by the vehicle operator between the LOCK, ACCESSORY, RUN, and START ignition states. This causes changes in the ignition status signals on the vehicle's Controller Area Network-Chassis (CAN-C) data bus networks and hardwired outputs controlled by the starting system master. As far as the vehicle's ignition

system is concerned, keyless go control is undetectable from legacy conventional control that uses a rotational switch and key. The K-line and the START/STOP button hardwire signals are used in tandem to determine the START/STOP button states.

KIN Function:

- When the Go-button on the KIN is pressed, the RFH is signalled with "request to start".
- The RFH then uses the LF antennas to communicate with the key fob and confirms that the key fob is located inside the vehicle.
- Once located, the key fob's response is evaluated by the RFH to determine if the key fob is valid for the vehicle. This process completes 'FOB authentication'.
- The RFH needs to verify the brake sensor input, for starting. When the brake is applied, the brake active sense signal is generated by the Body Control Module (BCM) via a CAN bus message.
- Once successfully completed, the RFH next sends the BCM the ignition switch position, which then allows the 'request to start' command.

KIN illumination:

- The KIN receives K-Line communication from the RFH to illuminate the ignition position LEDs associated with the current ignition position.
- The RFH controls dimming based on the following bus messages from the BCM: sun sensors daylight data provided by the Heating Ventilation and Air Conditioning (HVAC) module and panel illumination position which is the thumb wheel next to the headlamp switch.

If the key fob is not detected:

If the key fob battery has a low battery level or there is interference that jams the signal from the key fob (for example, a key fob is placed next to or in close proximity of electronic badges, cell phones, metal objects) which prevents the RFH and the KIN from performing the normal Radio Frequency (RF) based Keyless Go authentication, the KIN module has a back-up means to perform the key fob authentication:

- Press the front of the key fob on the center of the START/STOP button, perpendicular to the surface of the button.
- Hold the key fob for 2 Seconds after while pressing the START/STOP button with it to complete authentication of the key fob.

The back up KIN (START) process includes:

- Press START/STOP button with the front of the key fob once = Transitions to Accessory
- Press START/STOP button again = Transitions to Run
- Press START/STOP button again = Transitions to OFF
- Press START/STOP button with the front of the key fob once with brake applied = Transition to Start

The back up KIN (START) process required so as not to strand a customer due to a low power battery issue in the key fob or interference scenario. The KIN supplies a low voltage to a coil internally to power the FOBIK and read the key information.

After putting the vehicle into **P**ark, pressing the KIN's Go-button allows the vehicle's engine to be shut off. In an emergency, pressing the Go-button continuously for 2 seconds or repeatedly (one hit every 30- 500 ms) will cause the engine to shut off when vehicle speed is greater than 1 km/h (5 mph).

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the Integrated Center Stack (ICS) module. Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND INSTALLATION](#).



3. Disconnect the Keyless Ignition Node (KIN) wire harness connector (1).



4. Remove the three screws (1) from the KIN.
5. Remove the KIN from the ICS module.

INSTALLATION

1. Position the KIN for installation.
2. Install the three screws for the KIN and tighten securely.
3. Connect the KIN wire harness connector.
4. Install the Integrated Center Stack (ICS) module. Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND INSTALLATION](#).

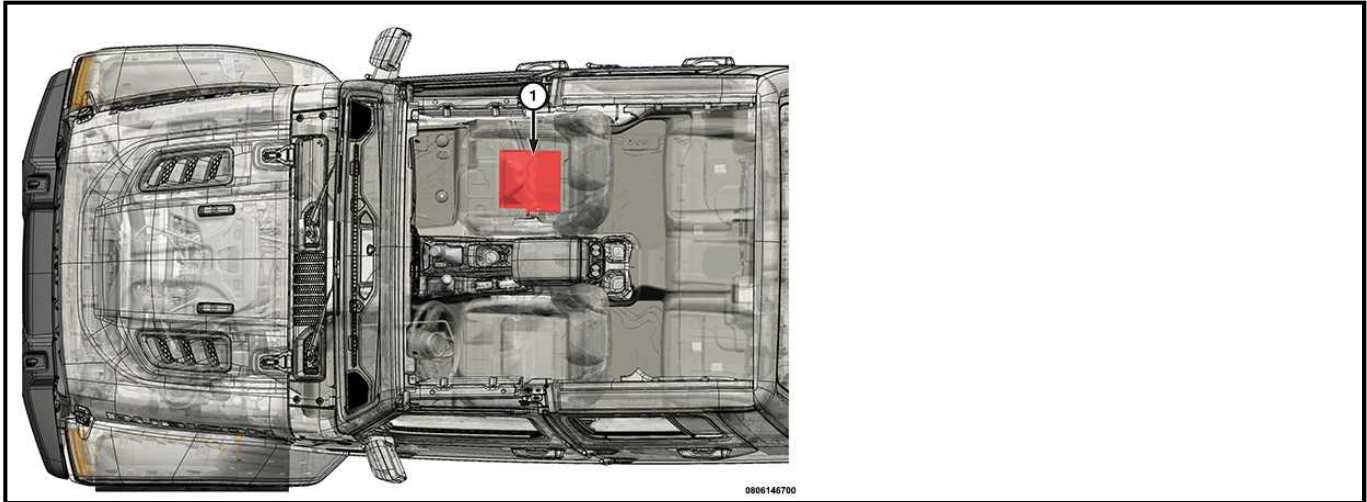
5. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE, OCCUPANT CLASSIFICATION (OCM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



In vehicles manufactured for domestic markets, the passenger side front seat incorporates the Occupant Classification System (OCS). The OCS consists of a single factory-calibrated unit, which includes the following components:

- **Electronic Pressure Sensor** - The electronic pressure sensor is integral and internal to the Occupant Classification Module (OCM) (1). Only the hose nipple for the pressure hose is visible on the outside of the OCM housing. The remainder of the sensor and the sensor circuitry are concealed and protected within the molded black plastic OCM housing.
- **Occupant Classification Module** - The OCM is located beneath the front of the passenger front seat cushion. Concealed within a hollow in the center of the molded black plastic OCM housing is the electronic circuitry of the module. The module housing is sealed to enclose and protect the internal electronic circuitry. A connector receptacle integral to the OCM housing contains terminal pins that connect the sensor to the vehicle electrical system through a dedicated take out and connector of the passenger front seat wire harness. A hose nipple formation is integral to the OCM housing.

A slot integral to the top of the OCM housing snaps over a blade on a stamped metal bracket bolted to the outboard upper seat track.

- **Pressure Hose** - Beneath the seat cushion a length of clear poly hose serves as the OCS pressure hose. The hose is securely clamped at one end to a hose nipple fitting that extends downward from the seat weight sensor, and at the opposite end to the hose nipple formation of the electronic pressure sensor integral to the outside of the OCM housing. The pressure sensor circuitry is internal and integral to the OCM. The pressure hose is filled with the same silicone fluid that fills the seat weight sensor.
- **Seat Cushion Foam** - The passenger front seat cushion foam is an integral part of the factory-calibrated OCS.
- **Seat Weight Sensor** - The seat weight sensor is sandwiched between the seat cushion springs and the seat cushion foam. A heavy plastic insulator pad is installed between the lower surface of the bladder and the seat cushion pan and springs. The bladder and pad are secured near the forward end to the seat cushion pan by three plastic push-in fasteners.

The bladder consists of two sheets of an elastomeric material and a molded plastic hose nipple fitting. The two sheets of elastomeric material are sealed together around their perimeter and joined at numerous specific intervals within their field. The hose nipple fitting is sealed to a small round hole in the lower

surface of the bladder and is pointed downward where it passes through a clearance hole in the insulator pad and extends to just below the seat cushion springs. The bladder is filled with a silicone fluid to become a pliable, quilted, resistive mat and is connected to a pressure hose that connects it to the electronic pressure sensor within the OCM unit.

- **Heat Mat** - If equipped with heated seats, the heat mat is sandwiched between the seat trim and the seat cushion foam and adhered to the foam. This component will be included in the service kits for heated seats and vented seats.
- **Vent Bag** - If equipped with vented seats, the vent bag is sandwiched between the seat foam and the OCM and adhered to the foam. This component will be included in the service kit for vented seats.

All of the components that make up the OCS, including the heat mat and vent bag, are a factory-calibrated and assembled unit. If the vehicle is equipped with either the heated seat, vented seat or both, these components must be replaced with the rest of the OCS components as they are calibrated together as one unit at the factory. **The OCS components cannot be adjusted or repaired and, if damaged or ineffective, they MUST ALL BE REPLACED AS A CALIBRATED UNIT.**

Any time the OCM is removed or replaced for any reason, the new OCS data must be re-zeroed using a diagnostic scan tool. Refer to the appropriate diagnostic information.

OPERATION

In vehicles manufactured for domestic markets, the OCS provides electronic message inputs to other electronic modules in the vehicle indicating whether the passenger front seat is occupied and the relative size classification of the seat occupant. The microcontroller within the OCM contains the OCS logic and communication circuitry. The OCM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with a diagnostic scan tool using the Controller Area Network - Chassis (CAN-C) data bus. This method of communication is also used for OCS diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel.

The seat weight sensor and the electronic pressure sensor integral and internal to the OCM allow the OCS logic circuits to sense the relative weight of a load applied to the passenger front seat cushion. When a load is applied to the seat cushion, silicone fluid within the bladder becomes pressurized. These changes in bladder fluid pressure are measured by the electronic pressure sensor circuitry through the OCS pressure hose. As the pressure within the bladder changes, the electronic pressure sensor input to the OCM microcontroller also changes. This electronic pressure sensor input allows the OCM to monitor the passenger front seat cushion by providing a weight-sensing reference to the relative load on the seat cushion.

Pre-programmed decision algorithms and OCS calibration allow the OCM microcontroller to determine the appropriate occupant classification based upon the seat cushion load as signaled by the pressure sensor. The OCM then sends the proper electronic **occupant classification status** messages over the CAN-C data bus to the Occupant Restraint Controller (ORC) and the ORC controls the deployment circuits for the passenger front supplemental restraints accordingly.

The OCM continuously monitors all of the OCS electrical circuits and components to determine the system readiness. If the OCM detects a monitored system fault, it sets an active Diagnostic Trouble Code (DTC) and sends the appropriate electronic messages to the ORC over the CAN-C data bus. Then the ORC sets a DTC and sends electronic messages to the Instrument Panel Cluster (IPC) to control airbag indicator operation. The OCM stores the DTC after the fault has been corrected.

The OCM receives battery current on a fused ignition output (RUN/START) circuit through a fuse in the Power Distribution Center (PDC). The OCM circuitry has a path to ground at all times through a ground circuit and take out of the instrument panel wire harness, which it shares with the ORC. This take out is secured to the body sheet metal. These connections allow the OCM to be operational whenever the ignition switch status is ON or START.

Occupant Classification Module

CAN-C Inputs

- Impact event status and bit toggle status
- Averaged ambient temperature
- ECU configuration 5 status
- ECU memory configuration
- Vehicle configuration
- Passenger seat belt status
- Passenger seat belt track position sensor status
- Passenger seat belt tension sensor status

CAN-C Outputs

- Passenger Seat OCS Status
- Passenger Seat OCS Fault Status
- Passenger Seat Belt Reminder Status

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, Occupant Classification System (OCS), seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to follow these instructions may result in accidental airbag deployment.

NOTE:

The Occupant Classification System (OCS) is used only in the passenger side front seat of vehicles manufactured for domestic markets. Vehicles manufactured for export markets use the Occupant Detection Sensor (ODS) instead of the OCS on the passenger side front seat.

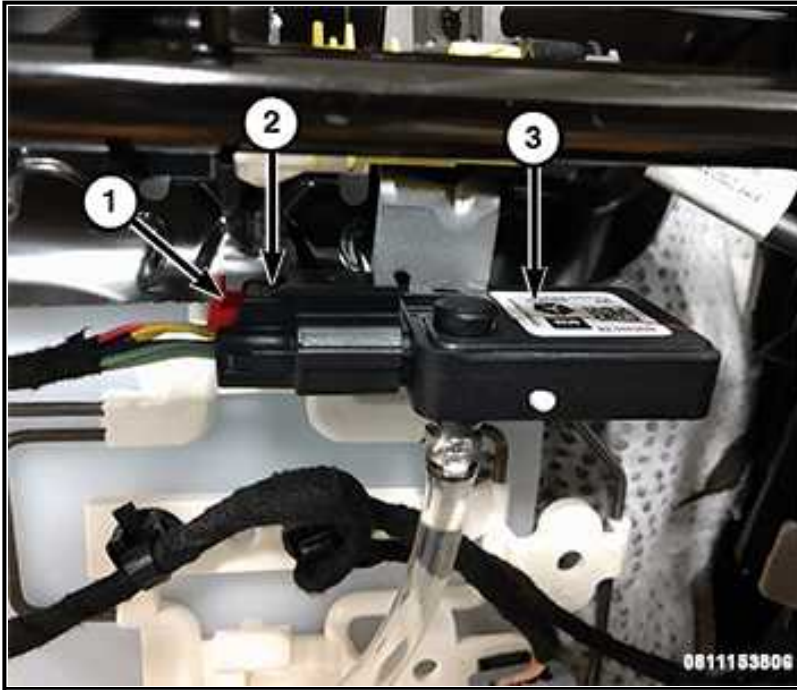
NOTE:

All of the components of the OCS including the Occupant Classification Module (OCM), the seat weight sensor, the plastic insulator seat weight sensor pad, the passenger seat cushion foam, the electronic pressure sensor, the OCS pressure hose, and the heat mat and vent bag (if equipped), are serviced only as a factory-calibrated and assembled unit. Any time any one of these components requires replacement for any reason, the entire calibrated OCS must be replaced and re-zeroed. Refer to the appropriate diagnostic information.

NOTE:

If **ONLY** the seat trim requires replacing and no other components are compromised. Replace the trim and follow the OCS re-zeroing process. Refer to the appropriate diagnostic information.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the passenger front seat from the vehicle. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#) .

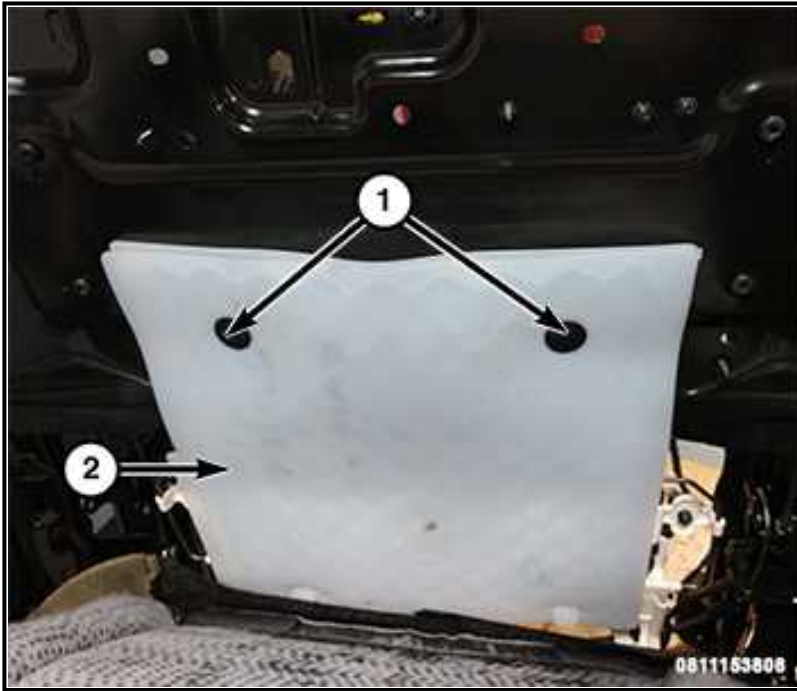


3. Disengage the Connector Position Assurance (CPA) (1) on the seat wire harness connector (2).
4. Disconnect the seat wire harness connector (2) from the OCM connector (3) beneath the outboard front corner of the seat cushion pan.



5. Using a small flat-bladed screwdriver or a small pick tool, carefully pry the latch tab integral to the OCM connector (1) to release it from the blade of the mounting bracket (2) beneath the outboard front corner of the seat cushion.
6. Remove the cover and foam seat cushion from the passenger front seat. Refer to [COVER, SEAT CUSHION, REMOVAL AND INSTALLATION](#) .

NOTE: If equipped with heated seats, vented seats or both, remove the heat mat and vent bag with the seat cushion.



7. Remove the two push-in plastic fasteners (1) that secure the seat weight sensor and the plastic insulator seat weight sensor pad (2) to the seat cushion pan.
8. Remove the seat weight sensor, the pad, the pressure hose and the OCM with integral electronic pressure sensor from above the front seat cushion as a unit.
9. If any of the OCS components requires replacement, discard the entire OCS unit. **Replace it with the entire contents of the factory-calibrated service replacement package, which includes an OCM with integral and internal electronic pressure sensor, a pressure hose, the seat weight sensor, the plastic insulator seat weight sensor pad, the heat mat (if equipped), the vent bag (if equipped) and the seat cushion foam.**

NOTE: If the vehicle is equipped with heated seats, vented seats or both, the proper OCM service kit is boxed together but not attached.

INSTALLATION

NOTE: All of the components of the OCS including the OCM, the seat weight sensor, the plastic insulator seat weight sensor pad, the passenger seat cushion foam, the electronic pressure sensor, the OCS pressure hose, and the heat mat and vent bag (if equipped), are serviced only as a factory-calibrated and assembled unit. Any time any one of these components requires replacement for any reason, discard all of the removed OCS components including the OCM with integral and internal electronic pressure sensor, the pressure hose, the seat weight sensor, the plastic insulator seat weight sensor pad, the heat mat and vent bag (if equipped), and the seat cushion foam and replace them with the entire contents of the proper factory-calibrated OCS service replacement package, then re-zero the OCS. Refer to the appropriate diagnostic information.

1. Position the seat weight sensor, the plastic insulator seat weight sensor pad, the OCS pressure hose and the OCM with integral electronic pressure sensor to the top of the front seat cushion pan as a unit. Lift the back of the seat weight sensor and pad far enough to access and insert the OCM and pressure hose between the seat cushion springs to the underside of the seat cushion. Be certain the pressure hose is not pinched or kinked.
2. Install the two push-in plastic fasteners that secure the seat weight sensor and plastic insulator pad to the seat cushion pan.

3. Install the foam cushion with heat mat and vent bag, if equipped, and seat cover to the seat. Refer to [COVER, SEAT CUSHION, REMOVAL AND INSTALLATION](#) .

NOTE: If the vehicle is equipped with heated seats, vented seats or both, the proper OCM kit will come with these components attached to the new seat cushion foam.

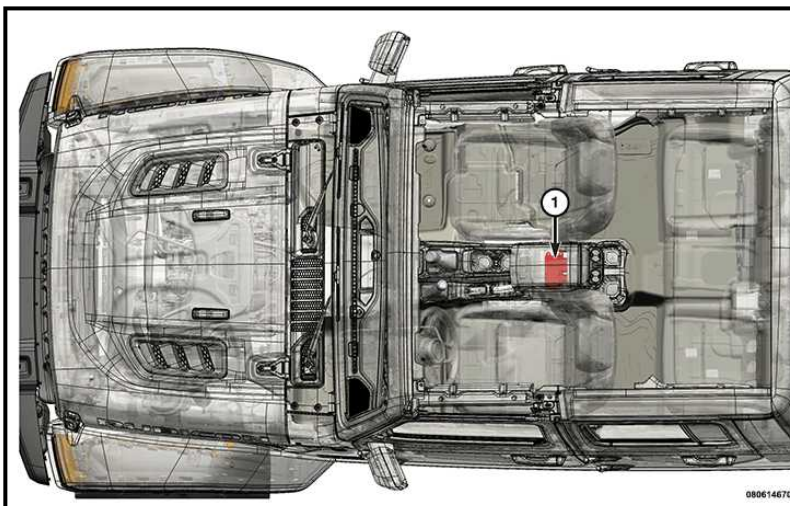
4. Collect **ALL** of the OCS components, including the seat cushion foam assembly replaced during this repair procedure. Insure **ALL** parts are the original equipment parts. Return **ALL** removed parts to the Mopar Quality Center / QEC for root cause evaluation. If the original equipment removed parts have not **ALL** been replaced, return to Step 1 and complete all steps of the repair process.
5. From the underside of the seat, snap the OCM to the blade of the mounting bracket beneath the outboard front corner of the seat. **Be certain the OCM has not been rotated in a fashion that puts torsion on the hose, this will cause the hose to kink.**
6. Connect the seat wire harness connector to the OCM.
7. Engage the CPA on the seat wire harness connector.
8. Install the passenger front seat into the vehicle. Refer to [SEAT, FRONT, REMOVAL AND INSTALLATION](#) [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#) .
9. Do not connect the negative battery cable at this time. The Supplemental Restraint System (SRS) Verification Test procedure should be performed following service of any SRS component. Refer to [SUPPLEMENTAL RESTRAINT SYSTEM VERIFICATION TEST](#) .
10. Following successful completion of the SRS Verification Test procedure, perform the OCM System Verification Test procedure found in the diagnostic scan tool under Miscellaneous Functions. Refer to the appropriate diagnostic procedures.

CONTROLLER, OCCUPANT RESTRAINT (ORC)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Occupant Restraint Control (ORC) module, located on the floor tunnel under the instrument panel center console, monitors the impact and occupant sensors and activates restraint system devices in the event of an impact. The ORC also contains impact sensors that are used to determine the level of deployment and to verify the information received from the remote sensors.

An arrow printed on the ORC label indicates the installation orientation. The arrow must point toward the front of the vehicle. The ORC must be installed correctly for correct restraint system operation.

The ORC module will set a specific Diagnostic Trouble Code (DTC) which cannot be deleted, not even using the diagnostic tool. This will happen when you reach:

- 3 activations of the tensioners
- 3 activations of the side airbags
- 1 activation of the tensioners plus the front airbags; all versions
- Any other combination of the above mentioned cases until one of the limits is reached

When one of the above mentioned limits is reached, the ORC module will have to be replaced.

The yaw or lateral acceleration sensor is installed inside the ORC module and is used for the correct operation of the vehicle dynamic stability functions.

The impact sensor and safing sensor internal to the ORC are calibrated for the specific vehicle, and are only serviced as a unit with the ORC. In addition, there are unique versions of the ORC for vehicles with or without certain optional Supplemental Restraint System (SRS) components. The ORC cannot be repaired or adjusted and, if damaged or ineffective, it must be replaced.

OPERATION

The microcontroller within the ORC contains the SRS logic circuits and controls all of the SRS components. The ORC uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network - Chassis (CAN-C) data bus. This method of communication is used for control of the airbag indicator in the Instrument Panel Cluster (IPC) and for SRS diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel.

The ORC microcontroller continuously monitors all of the SRS electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets an active and stored DTC and sends electronic messages to the IPC over the CAN-C data bus to turn ON the airbag indicator. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition cycle, while a stored fault causes a DTC to be stored in memory by the ORC. For some DTCs, if a fault does not recur for a number of ignition cycles, the ORC will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The ORC receives battery current through two circuits; a fused ignition switch output (RUN) circuit through a fuse in the Body Control Module (BCM) and a fused ignition switch output (RUN/START) circuit through a second fuse in the BCM. The ORC receives ground through a ground circuit and take out of the instrument panel wire harness that is secured by a nut to a weld stud on the floor panel transmission tunnel. These connections allow the ORC to be operational whenever the ignition switch is in the START or ON positions.

The ORC also contains an energy-storage capacitor. When the ignition switch is in the START or ON positions, this capacitor is continually being charged with enough electrical energy to deploy the SRS components for up to one second following a battery disconnect or failure. The purpose of the capacitor is to provide backup SRS protection in case there is a loss of battery current supply to the ORC during an impact.

Various sensors within the ORC are continuously monitored by the ORC logic. These internal sensors, along with several external impact sensor inputs allow the ORC to determine both the severity of an impact and to verify the necessity for deployment of any SRS components. Remote front impact sensors are located on the back of the right and left vertical members of the radiator support inboard of the headlamps. The electronic impact sensors are accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact.

The ORC also monitors inputs the front seat belt switches, an internal rollover sensor and four additional remote side impact sensors located on the left and right front door hardware module carriers and on the right and left lower B-pillars to control deployment of the side curtain airbag units and, if equipped, the front Seat AirBags (SAB). The ORC uses the seat belt switch inputs along with inputs from the Occupant Detection

Sensor (ODS) in the passenger front seat cushion to support the seat belt alert feature, and will send electronic messages to the IPC to illuminate the seat belt indicator when appropriate.

The impact sensors within the ORC are electronic accelerometer sensors that provide an additional logic input to the ORC microcontroller. These sensors are used to verify the need for a SRS component deployment by detecting impact energy of a lesser magnitude than that of the primary electronic impact sensors, and must exceed a safing threshold in order for the SRS components to deploy. A separate impact sensor within the ORC provides confirmation to the ORC microcontroller of side impact forces. This separate sensor is a bi-directional unit that detects impact forces from either side of the vehicle.

Pre-programmed decision algorithms in the ORC microcontroller determine when the deceleration rate as signaled by the impact sensors indicate an impact that is severe enough to require SRS protection. When the programmed conditions are met, the ORC sends the proper electrical signals to deploy the front airbags, the front seat belt tensioners and either side curtain and, if equipped, seat airbag unit.

Occupant Restraint Controller

Inputs

- Ignition switch status
- Impact sensor status
- Seat track position sensor data
- Seat belt buckle status
- ORC fault status
- ORC environmental fault status
- ORC operational mode status
- ORC ignition status
- Lateral acceleration status
- Lateral acceleration fault status
- Longitudinal acceleration status
- Longitudinal acceleration fault status
- Calculated average vehicle speed
- Calculated average vehicle speed fault
- Crash signal
- Crash signal confirmation
- Impact type, severity and direction information
- Passenger seat occupancy status
- Wheel speed sensors status
- Wheel speed sensors fault status
- Steering angle value (counterclockwise positive)
- Steering angle fault status

Outputs

- ORC Z axis acceleration pitch data
- ORC Z axis acceleration pitch fault status
- ORC lateral acceleration data
- ORC lateral acceleration fault status
- ORC longitudinal acceleration data
- ORC longitudinal acceleration fault status
- ORC fault status

- ORC environmental fault status
- Crash signal
- Crash signal confirmation
- Impact sensor status
- Impact sensor fault status
- Impact type, severity and direction information

REMOVAL AND INSTALLATION

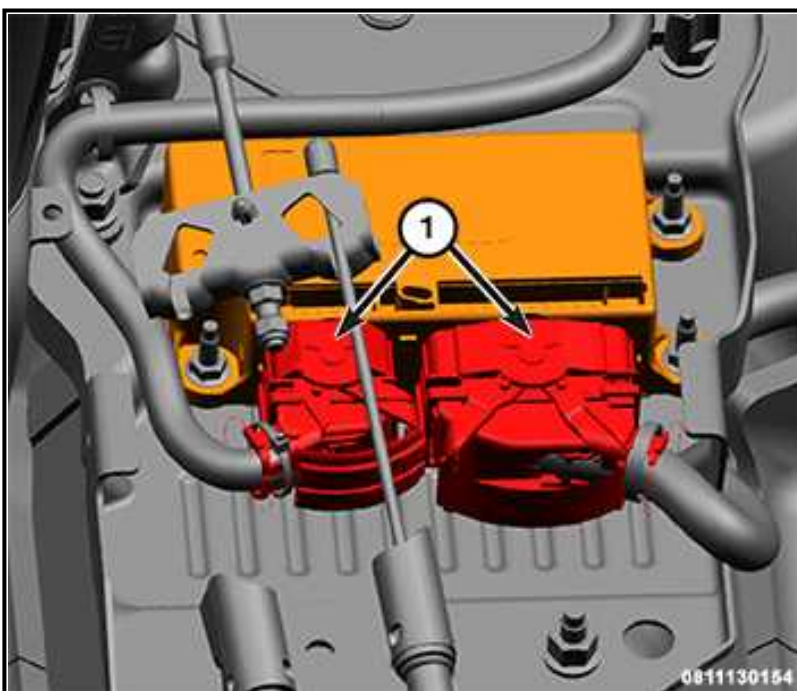
REMOVAL AND INSTALLATION

REMOVAL

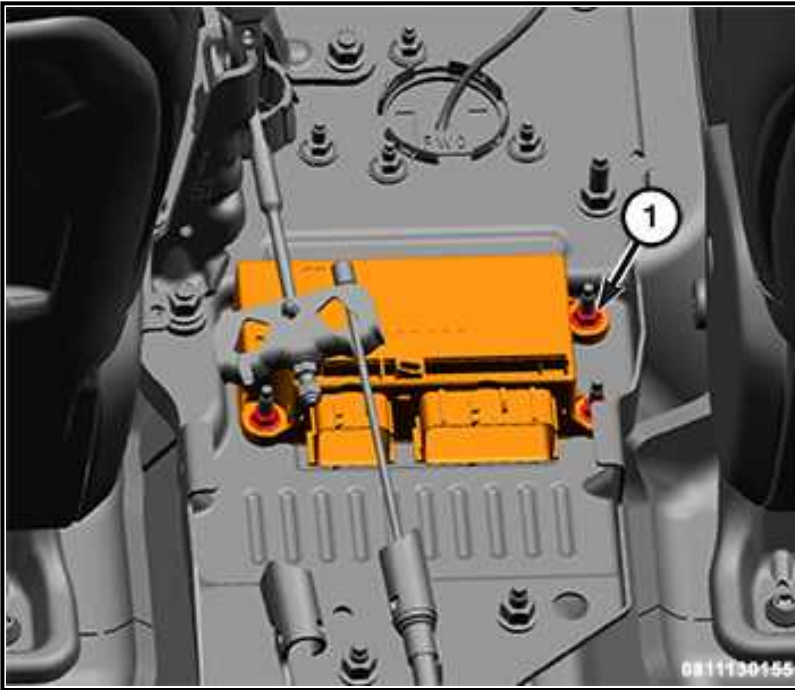
WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid serious or fatal injury, never strike or drop the Occupant Restraint Controller (ORC), as it can damage the impact sensor or affect its calibration. The ORC contains the impact sensor, which enables the system to deploy the SRS components. If an ORC is accidentally dropped during service, the module must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper SRS component deployment.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the floor console from the floor panel center tunnel. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connectors (1) from the ORC.



4. Remove the fasteners (1) that secure the ORC to the weld studs on the floor panel center tunnel.
5. Lift the ORC from the weld studs and remove it from the vehicle.

INSTALLATION

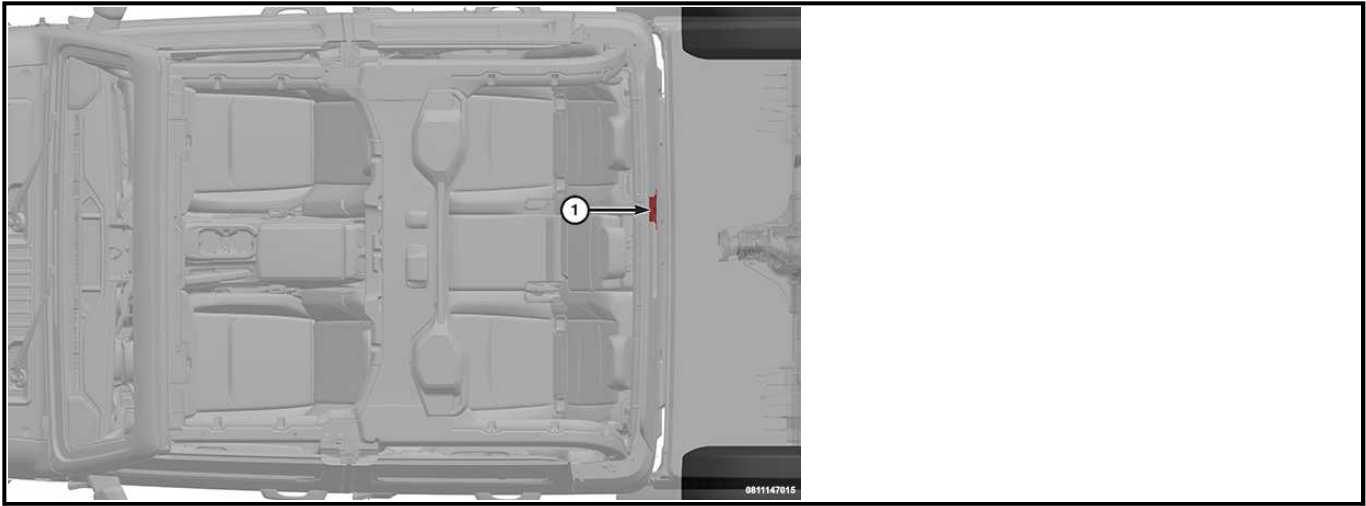
1. Carefully position the ORC to the weld studs on the top of the floor panel center tunnel. When the ORC is correctly positioned, the bottom of the housing will fit flush with the top of the center floor and the orientation arrow on the label on top of the housing will be pointed forward in the vehicle.
2. Install the fasteners that secure the ORC to the weld studs on the top of the floor panel center tunnel. Tighten the fasteners to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
3. Connect both wire harness connectors to ORC. Be certain that the latch on each connector is fully engaged.
4. Install the center floor console to the floor panel center tunnel. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .
5. Do not connect the negative battery cable at this time. The SRS Verification Test procedure should be performed following service of any SRS component. Refer to [STANDARD PROCEDURE](#) .
6. If this Electronic Control Unit (ECU) is being replaced with a new unit, the Initialize ORC Miscellaneous Function must be run using a diagnostic scan tool.

MODULE, PARK ASSIST (PAM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Park Assist Module (PAM) (1) for this vehicle is secured on the rear cabin wall. The module is connected to the vehicle electrical system through dedicated take outs of the body wire harness.

There are mounting tabs integral to the module housing that secure the module to the vehicle body. Two connector receptacles containing terminal pins that connect the module to the vehicle electrical system are integral to one side of the housing. One of the receptacles is utilized in this vehicles which is equipped with only the rear park assist system.

The PAM cannot be adjusted or repaired. If damaged or ineffective, it must be replaced with a new unit. The PAM software is flash programmable.

OPERATION

The PAM has the following characteristics:

- Receives battery current on a fused ignition output (RUN/START) circuit through a fuse in the Power Distribution Center (PDC)
- Receives ground through a ground circuit and take out of the body wire harness connected to the body sheet metal.
- Continuously monitors all of the park assist system electrical circuits and components to determine the system readiness.
- Provides voltage to the park assist sensors located in the bumper fascia
- Monitors return inputs from each of the sensors on dedicated hard wired data communication circuits. When an obstacle is detected the sensor inputs allow the PAM logic to calculate the relative location of the obstacle, and whether the distance to that obstacle is increasing or decreasing.
- It manages the presence of a possible trailer: it is configured to deactivate the rear sensors when a trailer is present.
- It communicates and transmits data over the high-speed Controller Area Network-Chassis (CAN-C) network.

When the programmed conditions are met the PAM sends electronic messages to the Instrument Panel Cluster (IPC) over the CAN data bus via the BCM to obtain the proper park assist system audible outputs and textual messages in the IPC display. The PAM also broadcasts electronic messages over the CAN data bus to enable the other electronic features of the park assist system.

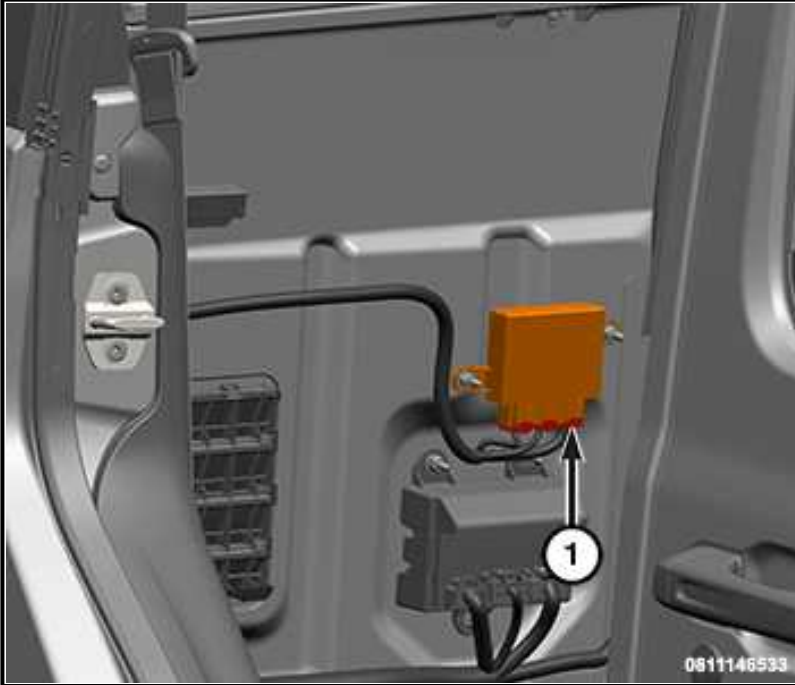
If a tow hook is present, the signal "Trailer presence" informs the PAM control unit to deactivate the rear sensors if a trailer is attached to the vehicle. The signal "Trailer presence" is sent by the Trailer Tow Module (TTM) via CAN-Internal High Speed (CAN-IHS) data bus. To ensure the proper operation of the system when the trailer is not attached to the vehicle, the PAM changes the sensor detection area range in order to take into account the space occupied by the tow hook.

REMOVAL AND INSTALLATION

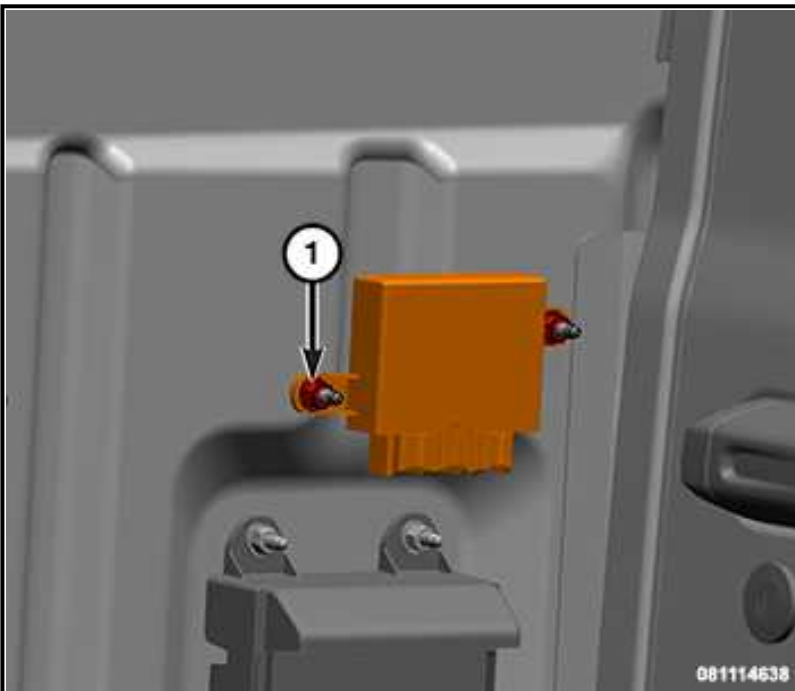
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the rear seat from the vehicle. Refer to [SEAT, SECOND ROW, REMOVAL AND INSTALLATION](#) .
3. Remove the subwoofer. Refer to [SPEAKER, REMOVAL AND INSTALLATION](#) .



4. Disconnect the three Park Assist Module (PAM) wire harness connectors (1).



5. Remove the two PAM to body mounting nuts (1) and remove the PAM from the vehicle.

INSTALLATION

1. Position the PAM in the vehicle and install the two PAM mounting nuts and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .

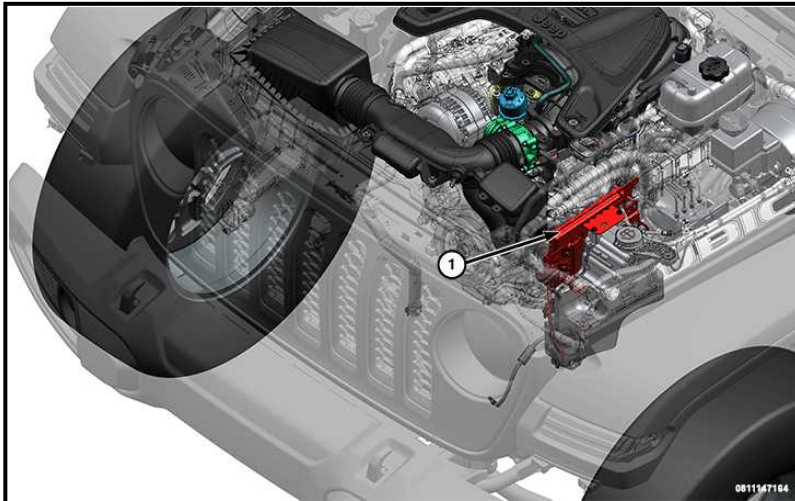
2. Connect the three PAM wire harness connectors.
3. Install the subwoofer. Refer to [**SPEAKER, REMOVAL AND INSTALLATION**](#) .
4. Install the rear seat back into the vehicle. Refer to [**SEAT, SECOND ROW, REMOVAL AND INSTALLATION**](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

MODULE, POWERTRAIN CONTROL (PCM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Powertrain Control Module (PCM) (1) is located next to the washer solvent reservoir. The PCM is a digital computer containing a microcontroller. The PCM receives input signals from various switches and sensors that are referred to as PCM inputs. Based on these inputs, the PCM adjusts various engine and vehicle operations through devices that are referred to as PCM outputs.

The PCM uses the Controller Area Network (CAN)-C bus to perform engine diagnostics and flash operations.

OPERATION

The PCM is a pre-programmed digital computer. The PCM operates the following:

- Fuel system
- Regulates ignition timing
- Air-fuel ratio
- Emission control devices
- Charging system
- Certain transmission features
- Speed control
- Air conditioning compressor clutch engagement
- Idle speed

The PCM can adapt its programming to meet changing operating conditions. It also receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as PCM outputs.

The PCM will operate in two different modes:

- Open loop - During open loop operation, the PCM still receives all input signals but, responds only to a limited amount of inputs based on the algorithms for output control. Inputs from the Oxygen (O2) sensors and other sensors (depending on the PCM programming) are not monitored during open loop modes.
- Closed loop - During closed loop operation, the PCM will monitor all inputs and outputs. These inputs indicate to the PCM whether or not the calculated output settings results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel.

By monitoring the exhaust oxygen content through the O2 sensor and all other inputs, the PCM has the ability to fine tune the air handling, fuel control, ignition timing and spark advance settings. This is done to achieve optimum fuel economy combined with low emission engine performance.

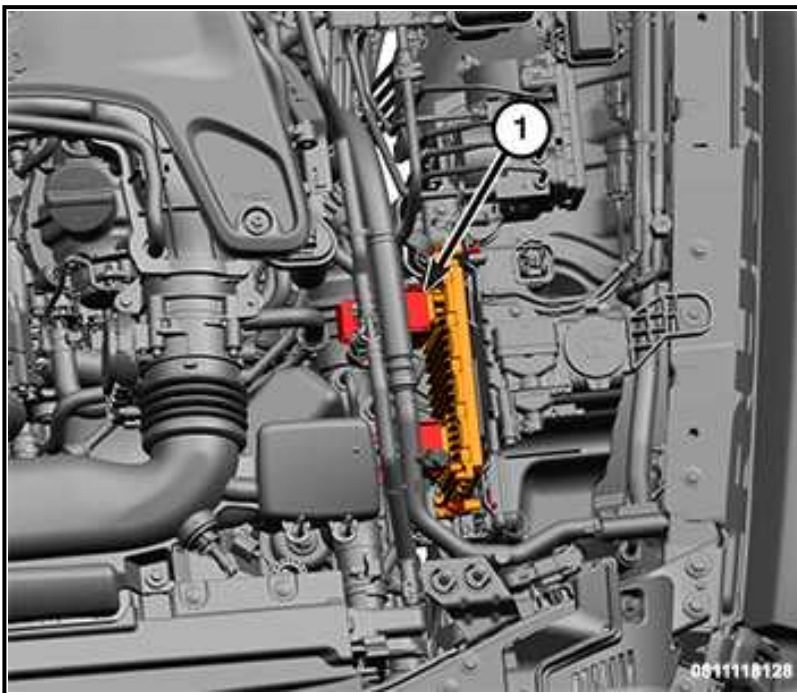
NOTE: Depending on vehicle build configuration, transmission and engine type the PCM will be programed with different software to meet the vehicle system needs. It is always important to verify the Vehicle Identification Number (VIN) number and software level in the PCM when diagnosing concerns related to the PCM.

REMOVAL AND INSTALLATION

3.6L

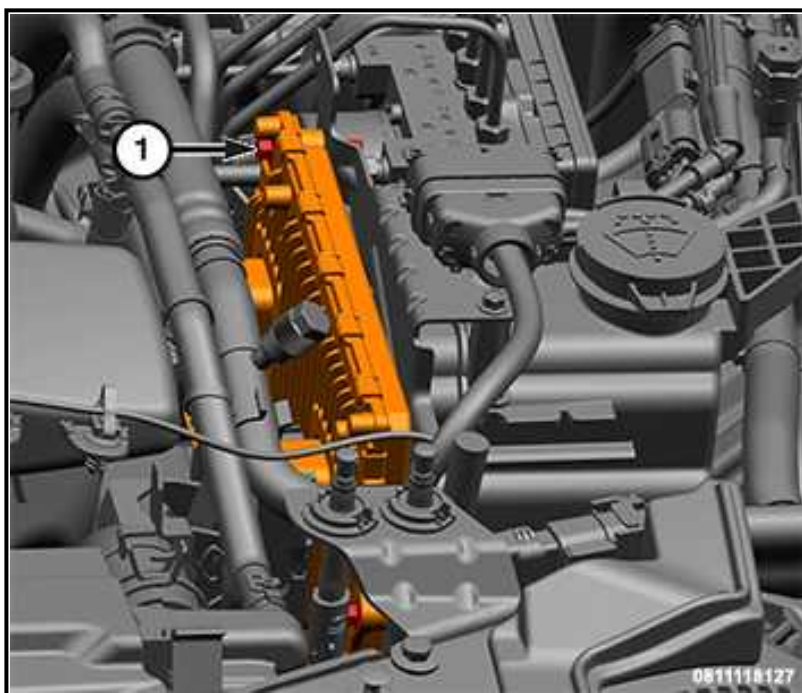
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



1 - PCM Harness Connectors

2. Remove the air cleaner resonator. Refer to [RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION](#) .
3. Disconnect the wire harness connectors from the Powertrain Control Module (PCM).



1 - PCM Harness Fasteners

4. Remove the PCM retaining fasteners.
5. Remove the PCM from the mounting bracket.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Check the pin connectors in the PCM. Also check the wire harness connectors for corrosion or damage. Repair as necessary.
- If installing a new PCM, use a diagnostic scan tool to program the new PCM. Refer to **MODULE, POWERTRAIN CONTROL (PCM), MODULE PROGRAMMING**.

NOTE: If the original Vehicle Identification Number (VIN) and original vehicle mileage is not programed into the PCM, a Diagnostic Trouble Code (DTC) may be set.

TORQUE SPECIFICATIONS

MODULES AND ACCESSORIES

DESCRIPTION	SPECIFICATION	COMMENT
Amplifier to Body	5 N.m (44 In. Lbs.)	-
BCM to Body	5 N.m (44 In. Lbs.)	-
Central Vision Processing Module (CVPM) to Body Bolts	5 N.m (44 In. Lbs.)	-
DTCM Bracket Mounting Nuts	9 N.m (82 In. Lbs.)	-
EPB Nut	6 N.m (53 In. Lbs.)	-
ORC Module	11 N.m (8 Ft. Lbs.)	-
PARK ASSIST MODULE TO BIW	3 N.m (26 In. Lbs.)	-
PCM to Bracket Bolts	8 N.m (71 In. Lbs.)	-
PCM to Bracket Nuts	8 N.m (71 In. Lbs.)	-

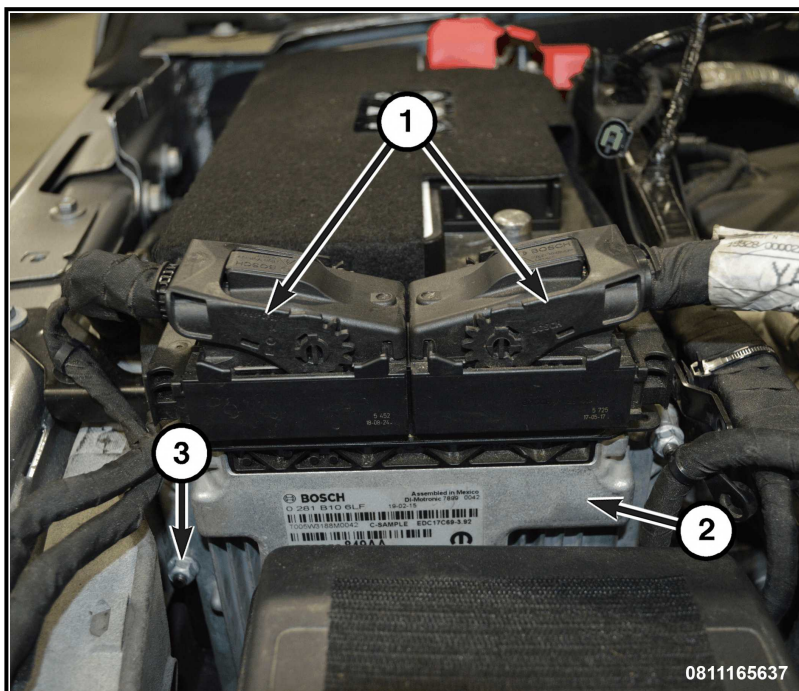
DESCRIPTION	SPECIFICATION	COMMENT
PCM Bracket to Body Bolts	6 N.m (53 In. Lbs.)	-
PCM Ground Wire Install	7 N.m (62 In. Lbs.)	-
PCM Ground Wire Nuts	9 N.m (82 In. Lbs.)	-
PDC to Wiring Connector	5 N.m (44 In. Lbs.)	-
PDC LOWER COVER Nuts	8 N.m (71 In. Lbs.)	-
Power Inverter Module Bracket to IP	8 N.m (71 In. Lbs.)	-
RFH Module to bracket	9 N.m (82 In. Lbs.)	-
Security Gateway Module to Speaker Enclosure	5 N.m (44 In. Lbs.)	-
Steering Column Control Module Band Clamp Screw	6 N.m (53 In. Lbs.)	-
Tire Pressure Monitoring (TPM) Module Bracket Nuts	7 N.m (62 In. Lbs.)	-

3.0L DIESEL

REMOVAL

NOTE: If the PCM is being replaced and is responsive, run the "ECU Replacement with Value Transfer" from the PCM Misc. Functions menu before removal.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



1 - PCM Harness Connectors
2 - PCM
3 - PCM Nuts

2. Disconnect the Powertrain Control Module (PCM) wire harness connectors.
3. Remove the nuts and the PCM.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Check the pin connectors in the PCM. Also check the wire harness connectors for corrosion or damage. Repair as necessary.
- If installing a new PCM, use a diagnostic scan tool to program the new PCM. Refer to **MODULE, POWERTRAIN CONTROL (PCM), MODULE PROGRAMMING**.

NOTE: If the original Vehicle Identification Number (VIN) and original vehicle mileage is not programed into the PCM, a Diagnostic Trouble Code (DTC) may be set.

TORQUE SPECIFICATIONS

MODULES AND ACCESSORIES

DESCRIPTION	SPECIFICATION	COMMENT
Amplifier to Body	5 N.m (44 In. Lbs.)	-
BCM to Body	5 N.m (44 In. Lbs.)	-
Central Vision Processing Module (CVPM) to Body Bolts	5 N.m (44 In. Lbs.)	-
DTCM Bracket Mounting Nuts	9 N.m (82 In. Lbs.)	-
EPB Nut	6 N.m (53 In. Lbs.)	-
ORC Module	11 N.m (8 Ft. Lbs.)	-
PARK ASSIST MODULE TO BIW	3 N.m (26 In. Lbs.)	-
PCM to Bracket Bolts	8 N.m (71 In. Lbs.)	-
PCM to Bracket Nuts	8 N.m (71 In. Lbs.)	-
PCM Bracket to Body Bolts	6 N.m (53 In. Lbs.)	-
PCM Ground Wire Install	7 N.m (62 In. Lbs.)	-
PCM Ground Wire Nuts	9 N.m (82 In. Lbs.)	-
PDC to Wiring Connector	5 N.m (44 In. Lbs.)	-
PDC LOWER COVER Nuts	8 N.m (71 In. Lbs.)	-
Power Inverter Module Bracket to IP	8 N.m (71 In. Lbs.)	-
RFH Module to bracket	9 N.m (82 In. Lbs.)	-
Security Gateway Module to Speaker Enclosure	5 N.m (44 In. Lbs.)	-
Steering Column Control Module Band Clamp Screw	6 N.m (53 In. Lbs.)	-
Tire Pressure Monitoring (TPM) Module Bracket Nuts	7 N.m (62 In. Lbs.)	-

MODULE PROGRAMMING

PCM PROGRAMMING

This procedure is required when one or more of the following situations are true:

- A Powertrain Control Module (PCM) has been replaced.
- Diagnostic Trouble Code (DTC) P1602 - PCM Not Programmed is set.
- An updated calibration or software release is available for either the PCM or Transmission Control Module (TCM).

This procedure assumes that the scan tool is properly configured to the dealership network with either a wired or wireless connection. For help on how to network the scan tool, use the "Help" tab at the top of the diagnostic application.

Programming Procedure - Using the scan tool:

1. Verify that the scan tool operating software is programmed with the latest software release.
2. Flash the Powertrain Control Module (PCM)
3. From the "Home" screen, select "ECU View"
4. Select "PCM"
5. Select "Misc functions"
6. Select "Check PCM VIN" and follow the on screen instructions. When complete, select "Finish".
7. Navigate back to the home screen and select the Body Control Module (BCM).
8. Select the "Misc Functions" menu.
9. Run the "Immobilizer ECU Replace" routine.
10. From the "Home" screen, select "ECU View"
11. Navigate back to the home screen and select "PCM"
12. Select "Misc functions"
13. Select "Learn ETC" and follow the on screen instructions. When complete, select "Finish".
14. Select "Check PCM Odometer" and follow the on screen instructions. When complete, select "Finish".
15. For manual transmission equipped vehicles, select and perform the "Clutch pedal position sensor learn" and the "Learn Gear Shift Sensor" procedures.
16. Perform the "Brake Pedal Learn" procedure as follows:
 1. Park the vehicle on level ground.

NOTE: When performing the Brake Pedal Calibration Learn routine, make sure the brake pedal is NOT pressed.

NOTE: Not all PCMs support the Brake Pedal Learn. If the PCM supports it the routine will be available.

2. With the scan tool, under the PCM "Miscellaneous Functions" menu, select and run the "Brake Pedal Learn" routine.

17. Cycle the ignition to complete the programming.

NOTE: Once the PCM process has been completed navigate back to the home screen and view "ALL DTCs", ensure that all DTCs that may have set are showing stored, if they are all stored select "Clear All Stored DTCs". Cycle the ignition to the off position and then back on and verify all DTCs are gone. At this point the process is complete.

2.2L - 3.0L

This procedure is required when one or more of the following situations are true:

- A Powertrain Control Module (PCM) has been replaced.
- Diagnostic Trouble Code (DTC) P1602 - PCM Not Programmed is set.
- An updated calibration or software release is available for either the PCM or Transmission Control Module (TCM).

This procedure assumes that the scan tool is properly configured to the dealership network with either a wired or wireless connection. For help on how to network the scan tool, use the "Help" tab at the top of the diagnostic application.

Programming Procedure - Using the scan tool:

1. Verify that the scan tool operating software is programmed with the latest software release.
2. Flash the PCM
3. Run the "Immobilizer ECU Replacement" from the Body Control Module (BCM) Misc. Functions menu.
4. Run the "VIN Verification" from the PCM Misc. Functions menu.
5. Run the "ECU Replacement with Value Transfer" from the PCM Misc. Functions menu.

NOTE: This can be run in two ways, with or without value transfer. With transfer is highly recommended as the manual programming will take over 30 minutes to complete. Transferring the old information should always be used unless the old Electronic Control Unit (ECU) is not responsive. If the old ECU is not responsive, proceed to the step procedure below

6. Perform the "Brake Pedal Learn" procedure as follows:

1. Park the vehicle on level ground.

NOTE: When performing the Brake Pedal Calibration Learn routine, make sure the brake pedal is NOT pressed.

NOTE: Not all PCMs support the Brake Pedal Learn. If the PCM supports it the routine will be available.

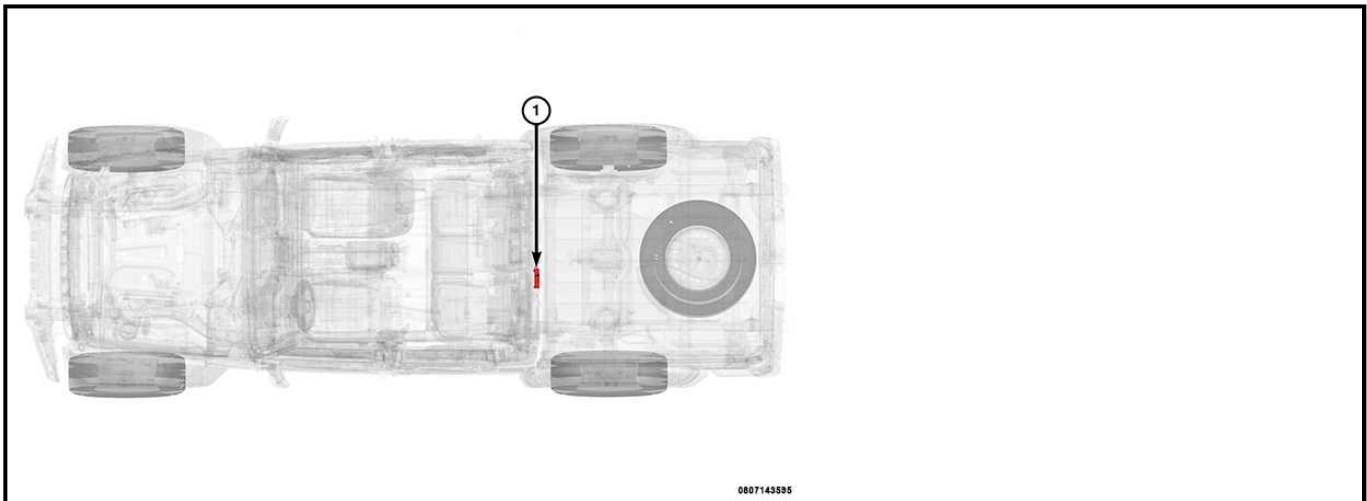
2. With the scan tool, under the PCM "Miscellaneous Functions" menu, select and run the "Brake Pedal Learn" routine.

7. Cycle the ignition to complete the programming.

MODULE, RADIO FREQUENCY (RF HUB)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION



DESCRIPTION

The Radio Frequency Hub (RFH) (1) is located behind the rear trim panel attached to the cab panel. The RFH:

- is secured in place with three nuts
- can have either two or three connections: a pink coaxial connector for remote start only, a 16 way connector, and a 20 way connector.

The RFH is an integrated receiver (base station) in the vehicle that interfaces with the key fob using both Radio Frequency (RF) and Low Frequency (LF) signals.

This model RFH has two connector receptacles integral to the RFH housing and are connected to the vehicle electrical system through dedicated take outs and connectors of the body wire harness. A remote start antenna is connected directly to the RFH through a third integral connector receptacle.

OPERATION

The RFH is an integrated receiver (or base station) in the vehicle that communicates with other electronic modules in the vehicle over either the Controller Area Network (CAN) data bus or a private serial bus. The RFH is also hard wired to the vehicle's door handles and multiple LF antennas. Using the data bus network and the hard wired signals, the RFH supports the following standard and optional vehicle features:

- **Keyless Go Ignition Systems** - In backup mode, the Keyless Ignition Node (KIN) communicates with the key fob through LF signals (125 KHz) then communicates the key fob information to RFH through a private serial K bus. The RFH then sends ignition status data over the bus to the Body Control Module (BCM) after a valid key fob is verified. The RFH also contains the controlling logic for the back lighting features of the KIN.
- The RFH will, at a minimum, receive the following information from the KIN:
 - START/STOP button states
 - Transponder authentication in back up mode

The RFH will, at a minimum, transmit the following information to the KIN:

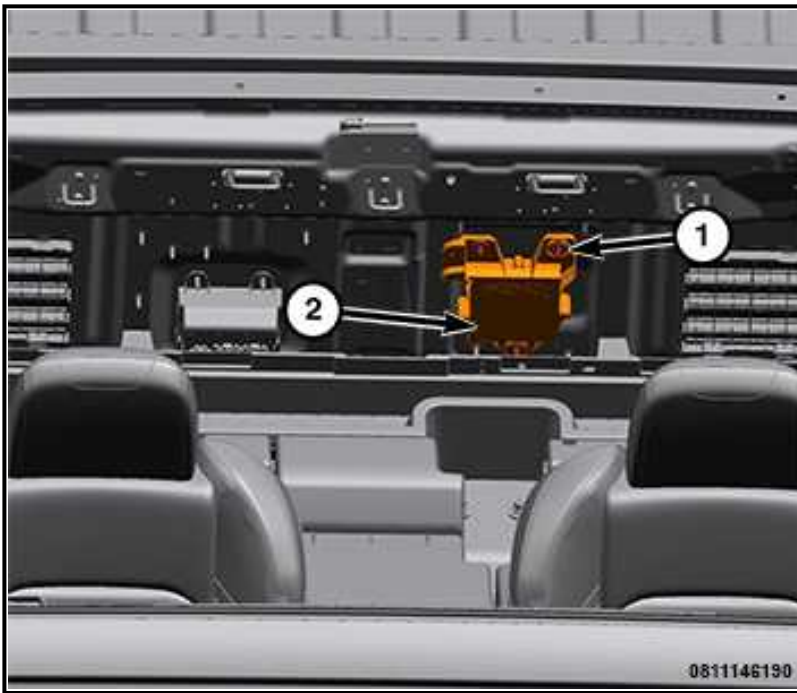
- START/STOP button backlighting control
- Ignition status ring back lighting control
- **Immobilizer System** - RFH uses a high security encryption system called Advanced Encryption Standard (AES) for the Immobilizer System. The RFH marries itself to the BCM and Powertrain Control Module (PCM) with AES at first ignition ON in the assembly plant. Then the system marries the key fobs, RFH, BCM and the PCM with unique secret keys for each vehicle. Swapping any of the married parts ARE NOT ALLOWED in the new system.
- **Passive Entry (PE)** - The RFH also uses AES for PE operation. If the Smart door handles or exterior release switches are activated, the RFH signals the LF antennas. The LF antenna wakes up the key fob then sends a challenge to confirm if it is the correct key fob. Then the key fob will respond to the RFH with the challenge response. When a valid key fob is recognized by the RFH, a CAN data bus message is sent to BCM to lock or unlock the vehicle by the RFH.
- **Remote Keyless Entry (RKE)** - The RFH receives and analyzes RF signals from the key fob; and after a valid key fob is verified, relays the appropriate electronic messages to the BCM over the CAN data bus to support the features of RKE functions.
- **Remote Start System** - The RFH receives and analyzes RF signals received from the key fob; and after a valid key fob is verified, relays the appropriate electronic messages to BCM over the CAN data bus to support all RKE functions including optional remote start function.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the cab back trim panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connectors from the Radio Frequency Hub (RFH) Module (2).
4. Remove three nuts (1) securing the RFH (2) to its rear cab.
5. Remove the RFH from the vehicle.

INSTALLATION

1. Position the RFH to the rear cab, install nuts, securely tighten.
2. Connect the wire harness connectors to the RFH.
3. Install the trim from the rear cab trim panel. Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#).
4. Connect the negative battery cable(s). Refer to the appropriate service information.
5. Using the diagnostic scan tool, the "Restore Vehicle Configuration" routine under the Body Control Modules (BCM) "Misc Functions". Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#).

MODULE PROGRAMMING

PROGRAMMING THE RF-HUB AND KEY FOBs

NOTE: When a BCM is going to be replaced at/during the same repair, before proceeding. Refer to [STANDARD PROCEDURE](#).

NOTE: An erase programmed key procedure is provided within the wiTECH service tool. A Personal Identification Number (PIN) is required to erase original fobs. If programmed fobs are erased accidentally, the originally programmed fobs can be reprogrammed to the SAME Vehicle Identification Number (VIN) ONLY. A pre-programmed fob cannot be reprogrammed to another VIN. A new blank fob obtained from Mopar service can be added to a VIN only once and will remain mated to the VIN; even if the fob is erased from the VIN/RF-Hub, it can, however, be reprogrammed.

NOTE: Do not put a Laptop or other wireless device (cell phone, cell phone, audio device, etc.) on top of or near the center console (between the seats to the dash). The Low Frequency (LF) antenna is below the center console, and these devices may interrupt programming. Verify that the key fob that is being programmed is inside the car, away from nearby consumer electronics.

Disconnect aftermarket cell phone chargers before attempting to program the key fob.

NOTE: The key fob must be held against the Keyless Ignition Node (KIN) during programming.

1. After the Radio Frequency Hub (RF-Hub) module has been replaced with a new unit, connect the diagnostic scan tool to the Data Link Connector (DLC). Refer to [CONNECTOR, DATA LINK \(DLC\), DESCRIPTION AND OPERATION](#).
2. Using the scan tool, navigate to the RF-Hub in the "Vehicle View" screen.
3. Use the scan tool to select "RF-HUB" and then perform the "RF-HUB Replace" routine.

NOTE: Steps 6-7 are only needed when programming a new key fob to the vehicle. If there are not new key fobs in use, proceed to step #8.

4. Using the scan tool, select "Program Ignition FOBIK" in the Miscellaneous Functions menu, and follow the on screen instructions.
5. Using the push button ignition, turn the ignition to the OFF position, wait 30 seconds, then cycle the ignition to the ON/RUN position.
6. Using the scan tool, check for active RF-Hub Diagnostic Trouble Codes (DTC). If a DTC is found, take corrective action as needed.
7. Using the push button ignition, turn the ignition OFF and check the Key Fob for proper operation.
8. Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

KEY FOB PROGRAMMING

NOTE: Do not put a Laptop or other wireless device (cell phone, cell phone, audio device, etc.) on top of or near the center console (between the seats to the dash). The Low Frequency (LF) antenna is below the center console, and these devices may interrupt programming. Ensure that the key fob that is being programmed is inside the vehicle, away from nearby consumer electronics. Disconnect aftermarket cell phone chargers before attempting to program the key fob.

Using Service Library, obtain a Personal Identification Number (PIN) before to starting the programming routine.

Sitting in the vehicle with the doors closed is a requirement for this routine to complete correctly.

NOTE: The key fob must be held against the Keyless Ignition Node (KIN) during key fob programming.

1. Using the diagnostic scan tool, select the Radio Frequency Hub (RFH).
2. Select the "Miscellaneous Functions" tab.
3. Select and run the "Program Ignition FOBIKs" procedure and follow the screen prompts.

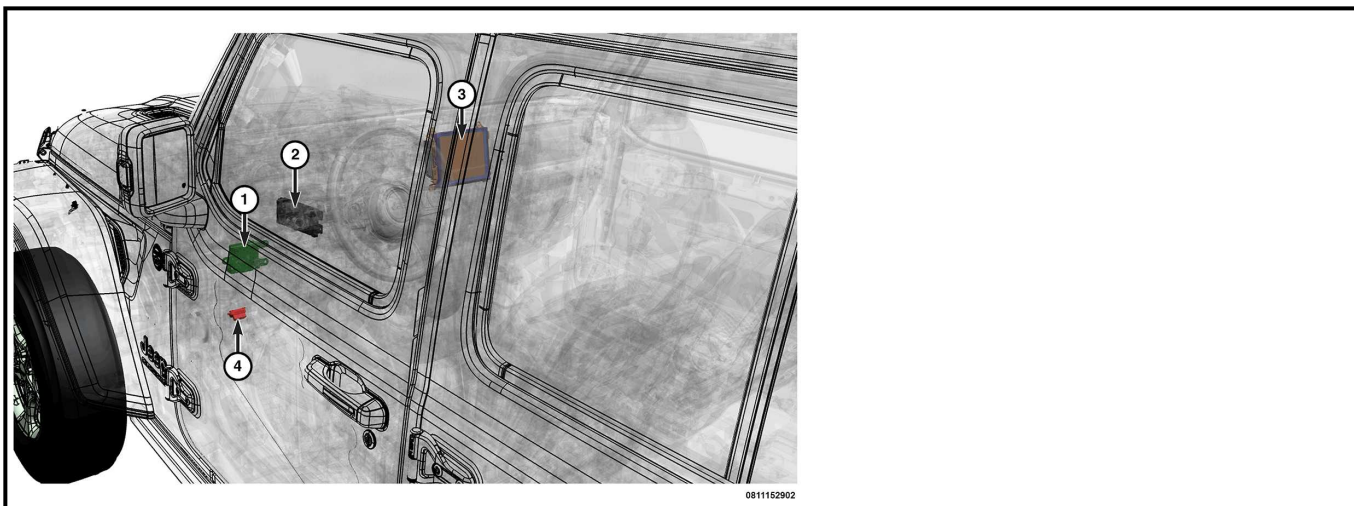
If the key fob fails to program or is inoperative. Refer to [DIAGNOSIS AND TESTING](#).

MODULE, SECURITY GATEWAY (SGW)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



1. Security Gateway Module (SGW)
2. Emergency Assistance Module (EAM) (Export Only)
3. Radio
4. Data Link Connector (DLC)

NOTE: The SGW is located behind the driver side instrument panel speaker enclosure.

The SGW is a security hardware device to stop unwanted access and threats to the Controller Area Network (CAN) for the vehicle. The SGW does not contain any drivers and therefore does not directly operate or control any vehicle components.

The complexity of in a vehicle networking has led to the development of a variety of bus standards and protocols that are specific to their communication domains. The SGW serves as the information bridge between these communication domains and the diagnostic scan tool and the radio. Hardware security features of the SGW are used to prevent unauthorized bus network access.

The SGW is flash programmable. Failure to flash a newly installed SGW will leave it in a locked mode. When in the locked mode, the SGW will not operate.

OPERATION

The SGW, located on the CAN architecture between the Data Link Connector (DLC), the radio and the EAM to prevent threats to the CAN bus systems through the DLC and access points. A secure connection must be present to allow authentication between the SGW and the diagnostic scan tool. The SGW contains up to eight dual wire CAN bus channels that comply with the industry standard CAN-Flexible Data-rate (CAN-FD) bus architecture. The SGW does not support partial networking functionality. Since the SGW is a frame gateway, it also does not provide signal gateway functionality.

For diagnostics of the SGW. Refer to [DIAGNOSIS AND TESTING](#) .

For Diagnostic Trouble Code (DTC) information. Refer to [DIAGNOSIS AND TESTING](#) .

REMOVAL AND INSTALLATION

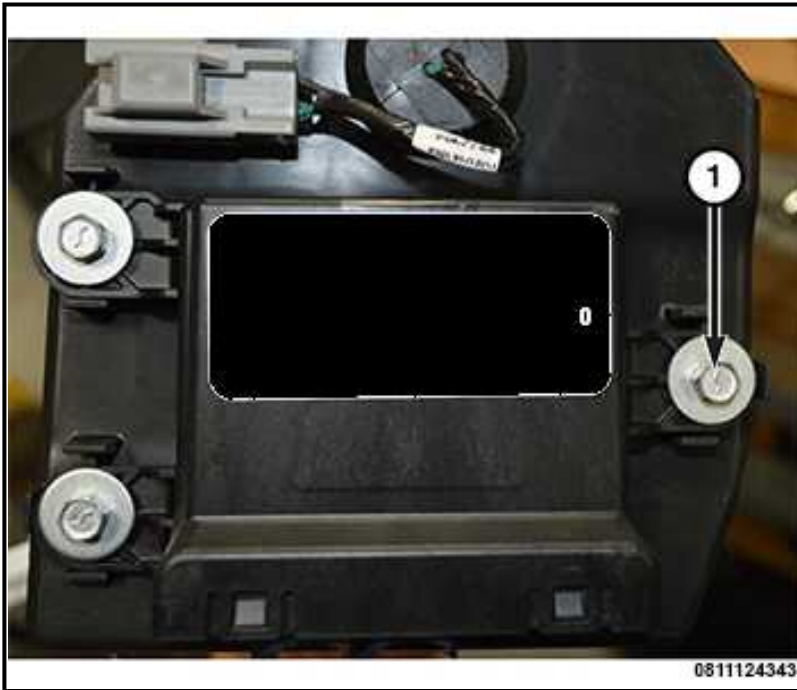
REMOVAL AND INSTALLATION

REMOVAL

NOTE: If a NEW Security Gateway (SGW) module is being installed, use the diagnostic scan tool to flash the module. Failure to flash the module will leave the SGW module in a locked mode preventing SGW module operation.

NOTE: The SGW module is mounted to the back side of the speaker enclosure.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the driver side speaker enclosure from the instrument panel. Refer to [ENCLOSURE, SPEAKER, REMOVAL AND INSTALLATION](#) .



3. Disconnect the SGW module wire harness connectors.
4. Remove the fasteners (1).
5. Remove the SGW module from the vehicle.

INSTALLATION

NOTE: If a NEW SGW module is being installed, use the diagnostic scan tool to flash the module. Failure to flash the module will leave the SGW module in a locked mode preventing SGW module operation.

1. Position the SGW module to the back side of the speaker enclosure.
2. Install the SGW module fasteners and tighten them to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
3. Connect the SGW module wire harness connectors.
4. Install the driver side speaker enclosure in the instrument panel. Refer to [ENCLOSURE, SPEAKER, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .
6. If this module has been replaced. Refer to [MODULE, SECURITY GATEWAY \(SGW\), MODULE PROGRAMMING](#).
7. If a NEW SGW module is installed, use the diagnostic scan tool to flash the SGW module.

MODULE PROGRAMMING

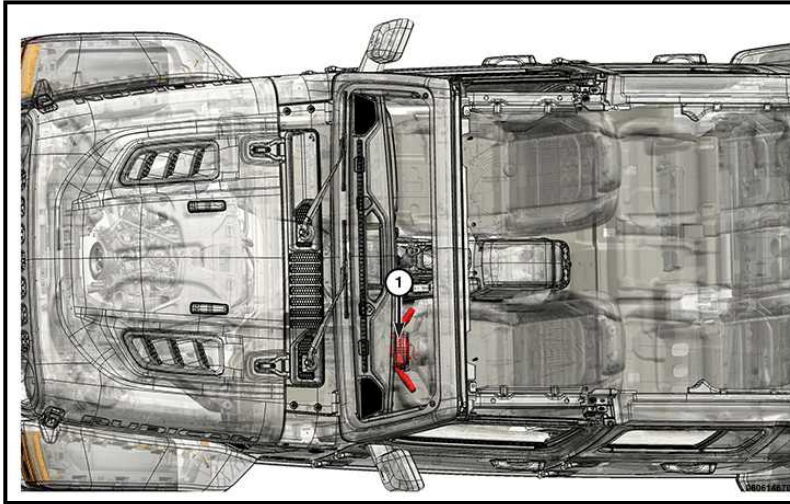
The Security Gateway (SGW) Module is shipped in a generic state. Use a diagnostic scan tool to perform the Flash Programming Procedure for the SGW module.

MODULE, STEERING COLUMN CONTROL (SCCM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Steering Column Control Module (SCCM) (1) is located at the top of the steering column just below the steering wheel. The SCCM includes the Steering Angle Sensor (SAS), the clockspring, the left (lighting) multifunction switch, and the right (wiper) multifunction switch.

The SCCM is secured to the steering column by an integral band clamp on the bottom of the instrument panel side of the SCCM. The SCCM has a centering attachment screw located on the top of the instrument panel side of the SCCM to be certain the SCCM is centered properly on the steering column.

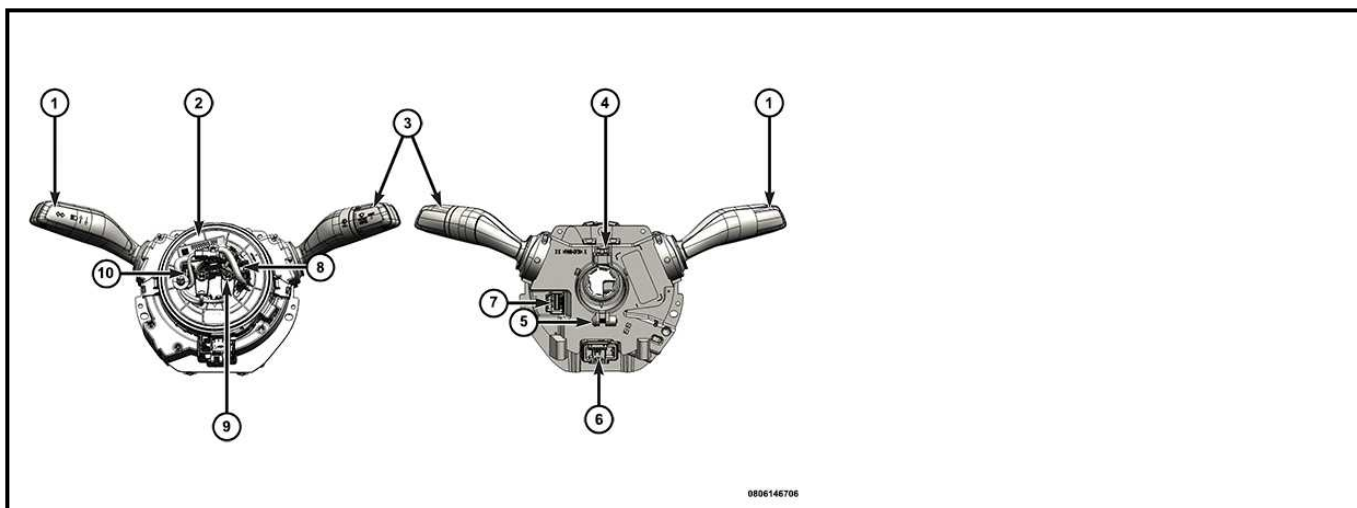
There are also unique lugs cast into the outer circumference of the steering wheel hub that must be engaged into slots within the inner circumference of the clockspring rotor hub to unlock and drive both the clockspring and the SAS. The steering wheel fastener must be tightened to specification to ensure proper clockspring and SAS function.

The SCCM includes two integral connector receptacles that face toward the steering wheel (front side) and are connected to the steering wheel electrical components through two take outs and connectors of the steering wheel wire harness. The 12-way receptacle at the 9 o'clock position contains the circuits for the Local Interface Network (LIN) data bus to the Body Control Module (BCM), the LIN data bus to the SCCM (internal to the SCCM), the horn signal, B(+) with Positive Temperature Coefficient (PTC), and ground. The 2-way receptacle at the 3 o'clock position contains the circuits for the heated steering wheel (if equipped). Both radio control switches are hardwired to the Electronic Vehicle Information Center (EVIC) switch on the left steering wheel spoke, which then uses the LIN data bus to communicate with the BCM. The surface of the rotor hub facing the steering wheel (front side) also has three short pigtail wires with connectors. The pigtail connectors contain the circuits for the Driver AirBag (DAB).

The SCCM also includes two integral connector receptacles that face toward the instrument panel (back side) and are connected to the vehicle electrical system through two take outs and connectors of the instrument panel wire harness. The 14-way receptacle at the 6 o'clock position contains the circuits for heated steering wheel (if equipped) from the Heated Seat Module (HSM) and the DAB from the Occupant Restraint Controller (ORC) module. The 12-way receptacle at the 9 o'clock position contains the circuits for the LIN data bus to the BCM, the horn signal to the BCM, fused B(+), ground and the Controller Area Network - Chassis (CAN-C) data bus.

The SCCM cannot be adjusted or repaired. If ineffective or damaged, the entire SCCM must be replaced as a unit.

OPERATION



The SCCM includes an electronic circuit board with a microcontroller. The microcontroller is a LIN bus master node and a gateway for the CAN-C data bus. The SCCM microcontroller provides power and ground to the multifunction switches of the SCCM, then utilizes integrated circuitry to monitor hardwired analog and digital return inputs from each of these switches. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#). The circuits for the horn switch, the optional heated steering wheel and the standard equipment DAB are pass-through circuits of the SCCM. The steering wheel-mounted electronic functions monitored by the SCCM include the cruise switches. The output of the horn switch is hardwired to the BCM.

The switch pods (if equipped) in the left and right horizontal spokes of the steering wheel are each LIN bus slave nodes. The switch states of the hands free communication switches and the EVIC control switches in the left switch pod are communicated over the LIN bus directly to the LIN bus master node of the BCM. The left switch pod also controls the back lighting of both switch pods. The switch states of the speed control switches in the right switch pod are communicated over the LIN bus to the LIN master node of the SCCM. The internal circuitry of the SCCM gateway then relays electronic message outputs communicating those switch states; SAS, turn signal (1) and wiper (3) stalk transmit data to other electronic modules in the vehicle over the CAN-C data bus.

Two fixed connector receptacles (6 and 7) on the SCCM connect to the instrument panel wire harness via two wire harness connectors.

The SCCM is connected to a fused B(+) circuit from the Power Distribution Center (PDC) and receives a path to ground through a circuit in the body wire harness that is secured to the sheet metal behind the driver kick panel at all times. These connections allow it to remain functional regardless of the ignition switch status. Any input to the SCCM that controls a vehicle system function that does not require that the ignition switch status be ON such as pressing the horn switch, prompts the SCCM to wake up and transmit on the CAN-C data bus.

The service replacement SCCM is shipped with the clockspring (2) centered within the SCCM and with a plastic locking tab installed. This locking tab should not be removed until the SCCM has been properly installed on the steering column. If the locking tab is removed before the steering wheel is installed on a steering column, clockspring centering must be confirmed by viewing the inspection window on the clockspring rotor. If the black boxes of the clockspring tape are not visible in the inspection window, the entire SCCM must be replaced with a new unit. Proper clockspring installation may also be confirmed by viewing the SAS data using a diagnostic scan tool. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#).

For additional information about the wiper stalk functions, Refer to [DESCRIPTION AND OPERATION](#).

For additional information about the lighting control stalk functions, Refer to [DESCRIPTION AND OPERATION](#).

For additional information about the heated steering wheel controls, Refer to [DESCRIPTION AND OPERATION](#).

For additional information about the SAS functions, Refer to [DESCRIPTION AND OPERATION](#).

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - STEERING COLUMN CONTROL MODULE

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, Occupant Classification System (OCS), seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to follow these instructions may result in accidental airbag deployment.

The hardwired circuits between components related to the Steering Column Control Module (SCCM) may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, wire harness routing and retention, connector pin-out information, and location views for the various wire harness connectors, splices, and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

REMOVAL AND INSTALLATION

STEERING COLUMN CONTROL MODULE (SCCM)

REMOVAL

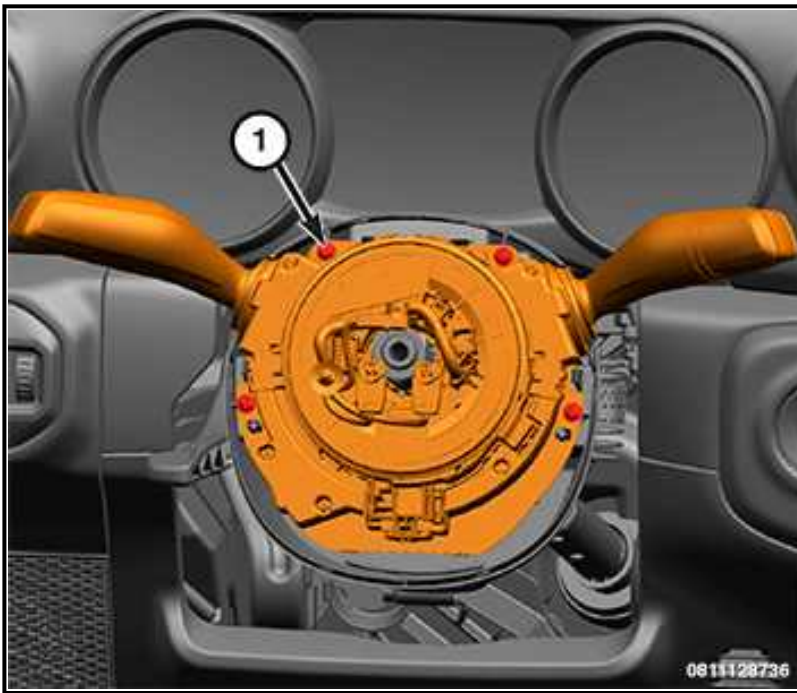
WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION:

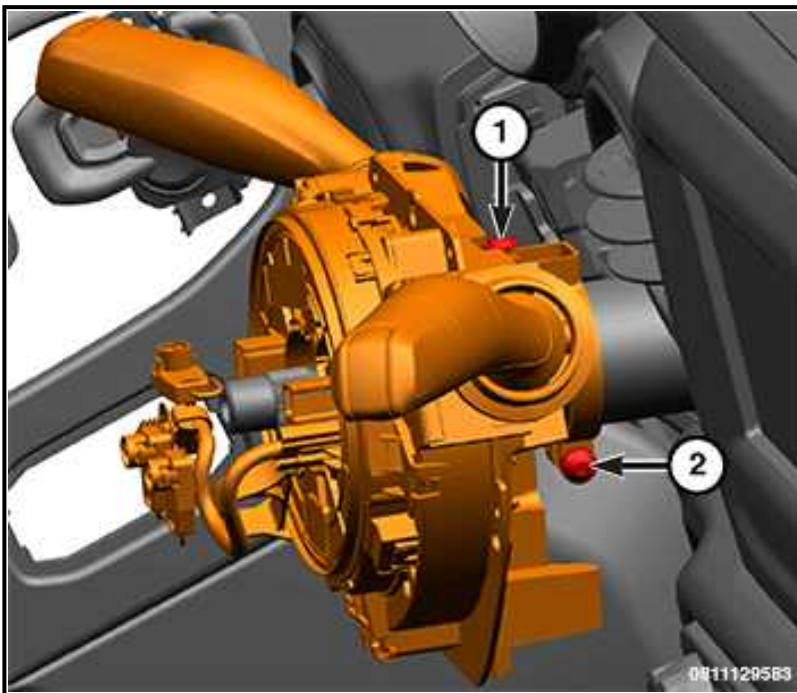
Always turn the steering wheel until the front wheels are in the straight-ahead position. Then, prior to disconnecting the steering column from the steering gear, lock the steering wheel to the steering column. If clockspring centering has been compromised for ANY reason, the entire Steering Column Control Module (SCCM) and clockspring unit **MUST** be replaced with a new unit.

1. Place the front wheels in the straight ahead position and inhibit the steering column shaft from rotation.
2. Extend the steering column to the fully extended position and lower it to its lowest (down) position.
3. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
4. If the SCCM is to be reused, be certain that the spring-activated clockspring lock has extended upward following steering wheel removal to lock the clockspring rotor and maintain clockspring centering until the steering wheel is installed on the steering column. **Do not manually compress the clockspring lock while the SCCM is removed from the steering column as this may result in the loss of clockspring centering.** If clockspring centering is not maintained, the entire clockspring and SCCM must be replaced with a new unit before the steering wheel is installed.
5. Remove the steering wheel. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#) .
6. Remove the outer shroud from the steering column. Refer to [SHROUD, STEERING COLUMN, REMOVAL AND INSTALLATION](#) .



1 - Steering Column Control Module (SCCM) Fasteners

7. Remove the fasteners from the SCCM.
8. Release the integral retainers for the inner shroud and push the inner shroud toward the instrument panel as far as it will go.



1 - Centering Attachment Fastener
2 - Clamp Fastener

9. Loosen the centering attachment fastener on the top, rear of the SCCM. Do not remove the fastener completely.
10. Loosen the clamp fastener to allow the SCCM to be removed. Do not remove the fastener completely.



1 - SCCM

11. Pull the SCCM away from the steering column inner shroud far enough to disconnect the SCCM wire harness connectors.
12. Remove the SCCM from the steering column.

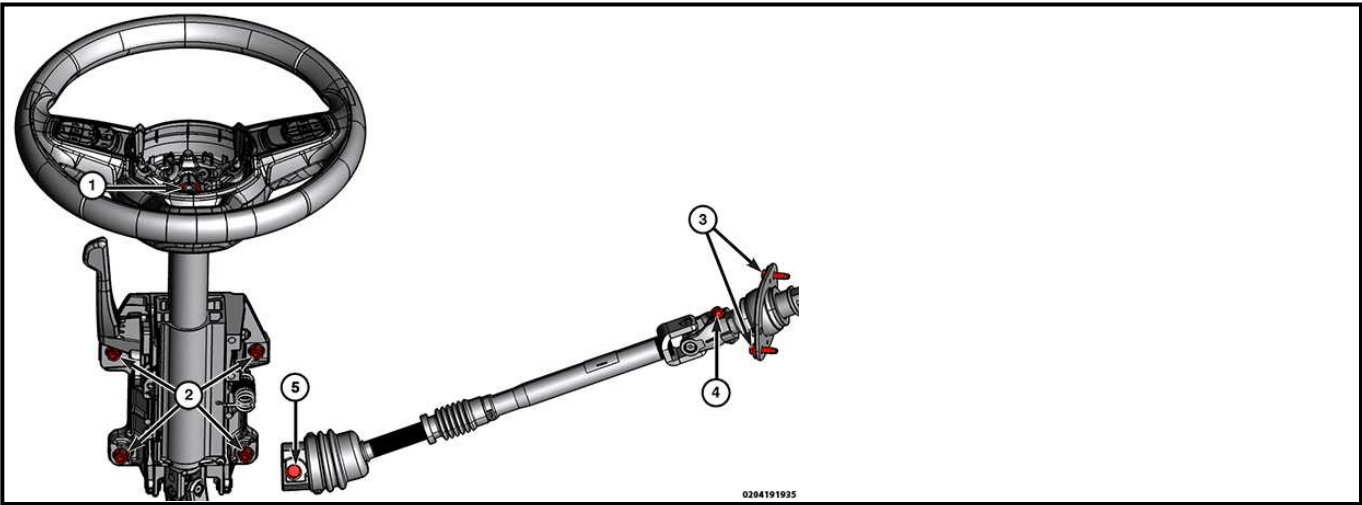
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

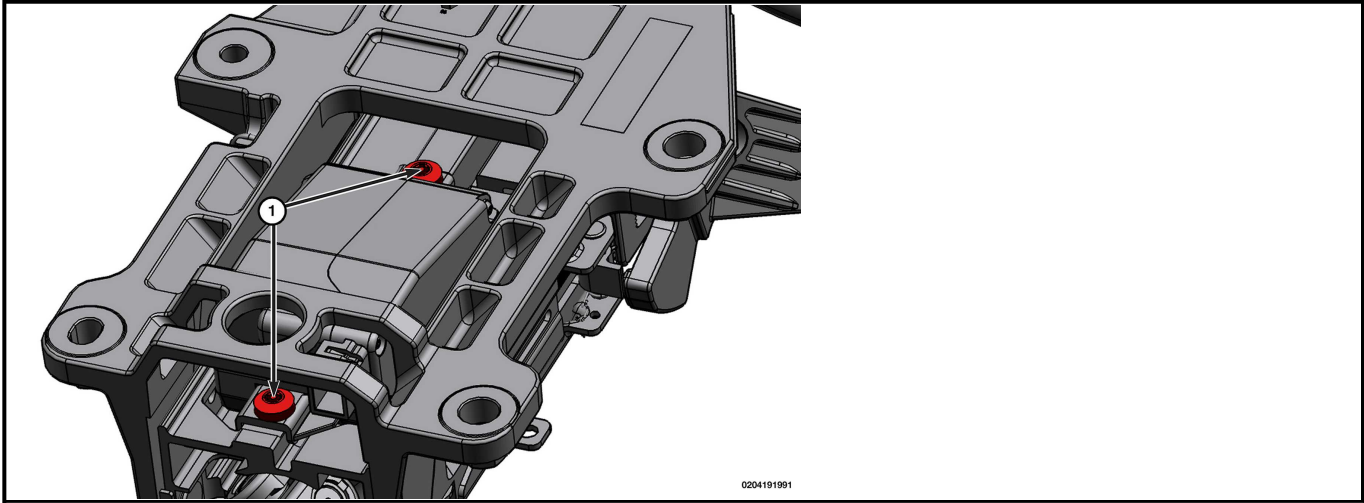
TORQUE SPECIFICATIONS

STEERING COLUMN

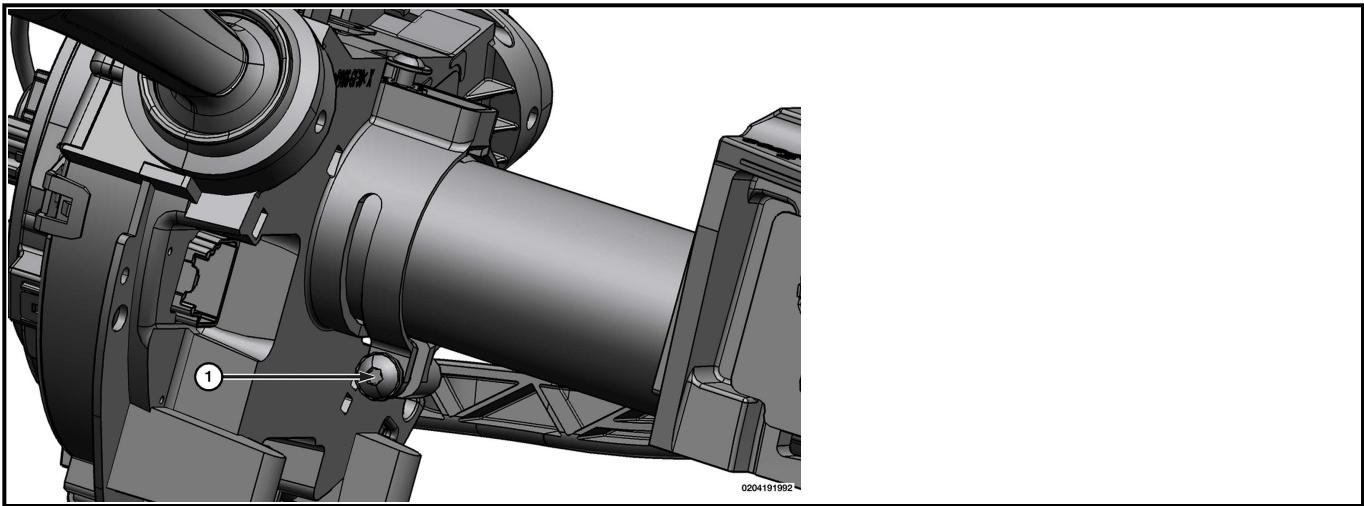


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Steering Wheel Nut	50 N. m (37 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
2	Steering Column Nuts	27 N. m (20 Ft. Lbs.)	

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
3	Bulkhead Bearing Bolt	9 N. m (7 Ft. Lbs.)	-
4	Intermediate Shaft Coupler Upper Pinch Bolts	34 N. m (25 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
5	Intermediate Shaft Coupler Lower Pinch Bolts	55 N. m (41 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Electronic Steering Lock (ESL) Module Bolts	8 N. m (71 In. Lbs.)	-



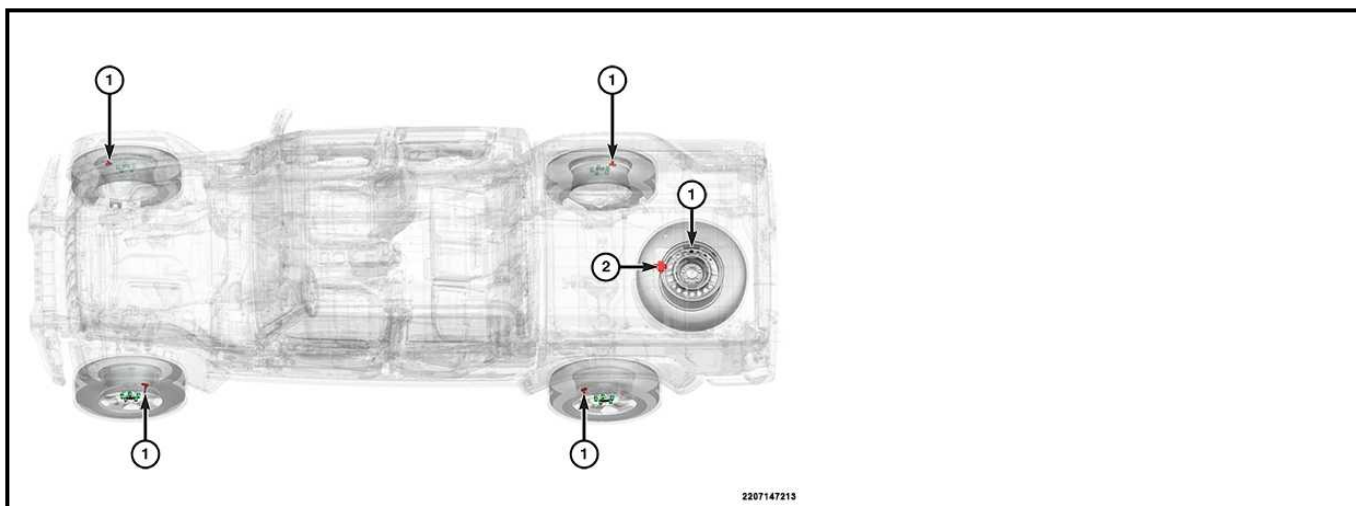
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Steering Column Control Module (SCCM) Band Clamp Fastener	6 N. m (53 In. Lbs.)	-

MODULE, TIRE PRESSURE MONITORING (TPM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Tire Pressure Monitoring (TPM) system is made up of the following:

COMPONENT INDEX

1.	Refer to TIRE PRESSURE SENSOR .
2.	Refer to TIRE PRESSURE MONITOR (TPM) .
-	Refer to INSTRUMENT PANEL CLUSTER (IPC) .

OPERATION

Vehicles can be equipped with a **Base** or a **Premium** TPM System.

The system monitors the pressure of each tire and warns the driver, when either a low tire pressure conditions or a TPM system malfunctions exists, through the IPC.

The **Base** TPM system only uses the TPM telltale, which is an audible chime and non-positional text messages to indicate low pressure or system fault conditions.

The **Premium** TPM system uses the base system TPM telltale audible chime and the vehicle information display to display the actual tire pressure values or dashes for each of the four active road tires in the correct vehicle position. Various text messages, as required, shall also be displayed in the vehicle information display.

This system consists of the following components: one TPM, four or five TPM sensors.

The TPM receives the radio signals from the tire pressure sensors and sends the relevant values to the other modules via Controller Area Network - Chassis (CAN-C). The TPM identifies the sensor position, receives the sensor data, compares the pressure data with the standard pressure values stored in the non-volatile memory, determines whether there is a problem in the tire pressure and stores the warnings regarding tire pressure and system faults. The TPM used the Radio Frequency (RF) Data from the TPM sensor and the wheel speed data to determine the location of each tire pressure sensor. When a sensor is installed in a tire on the vehicle, the TPM can automatically identify the sensor and its location during the first ensuing drive cycle. Identification (ID) will take approximately 20 minutes but the speed of the vehicle must exceed 24 km/h (15 mph). The TPM/RKE ANALYZER 2046300080 can be used to program the new sensor ID number in the TPM. The sensor IDs can also be programmed using a diagnostic scan tool to scan each TPM sensor at each road wheel, and store each sensor ID in the correct location.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to COMPONENT INDEX .
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The IPC for this vehicle is located in the instrument panel above the steering column opening. The IPC gauges and indicators are visible through an opening in the cluster bezel and are protected by a clear plastic cluster lens that is secured to the cluster housing by integral latch formations. Several versions of the IPC are offered on

this vehicle. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle is offered. The IPC utilizes integrated circuitry and information carried on the CAN data buses and CAN-Interior High Speed (IHS) along with several hard wired inputs to monitor other sensors and switches in the vehicle. In response to those inputs, the internal circuitry and programming of the IPC allow it to monitor many electronic functions and features of the vehicle. The IPC receives and manages the messages coming from the compass module and the humidity sensor (if present) via the Local Interface Network (LIN) data bus.

The IPC performs the following functions:

- Receives TPM A1 message from TPM module
- Process the information received from the TPM module
- Gives warning to the driver through a dedicated lamp, text messages and chime activation
- Manages the TPM indicator lamp function, text message and chime activation function for a loss of CAN communication

The IPC provides the following:

INPUTS

- Tire pressure indication requests from TPM
- Chime request from TPM
- TPM warning request to IPC
- TPM error request to IPC

OUTPUTS

- Odometer reading to TPM

TIRE PRESSURE MONITOR (TPM)

TIRE PRESSURE MONITOR (TPM)

Refer to **COMPONENT INDEX**.

The TPM is a module that is able to receive tire pressure, temperature, sensor ID and function code data via RF data transmitted from the sensors inside the wheel. The TPM stores all warning and fault conditions, placard pressure values, low pressure threshold values, all wheel sensor IDs and locations, and faults in memory that can be accessed through diagnostic communication. The TPM software is able to be re-flashed over the CAN bus through use of a diagnostic scan tool connected to the vehicle's diagnostic connector. The TPM controls the TPM indicator lamp function including conducting a bulb check operation at every ignition ON key cycle.

The unit has a CAN-C interface to connect it to the network and performs the following functions:

- Receives and processes RF signals from each TPM sensor
- Monitors TPM sensor status
- Manages internal power
- Performs self-test
- Implements algorithms and logic to generate low pressure and system malfunction warnings
- Transmits data from/to other modules on CAN-C
- Performs diagnostic functions via CAN bus

The TPM receives the following:

CAN-C INPUTS

- VSS signal supplied from the Anti-lock Brake System (ABS) Module

- Vehicle configuration supplied from Body Control Module (BCM)
- Ignition state supplied from BCM
- Averaged ambient temperature supplied from BCM
- Battery voltage input from BCM
- Current gear supplied by BCM
- Ambient air pressure (barometric pressure) supplied from Powertrain Control Module (PCM)
- Vehicle Identification Number (VIN) data and VIN message from PCM
- Odometer reading from IPC

The TPM provides the following:

CAN-C OUTPUTS

- Tire pressure indication requests to IPC
- TPM chime request to IPC
- TPM warning request to IPC
- TPM error request to IPC

The TPM receives the following:

RF INPUTS

- Left Front TPM Sensor
- Left Rear TPM Sensor
- Right Front TPM Sensor
- Right Rear TPM Sensor
- Spare Tire TPM Sensor (if equipped)

TIRE PRESSURE SENSOR

TIRE PRESSURE SENSOR

Refer to **COMPONENT INDEX**.

One tire pressure sensor is mounted to a valve stem specifically designed for mounting the pressure sensor in each wheel in place of the traditional tire valve stem. Each sensor has an internal battery that lasts up to 10 years. The battery is not serviceable. At the time of battery failure, the sensor must be replaced. The TPM sensor operates on a 433 MHz radio frequency. The tire pressure sensor valve stem looks similar to a standard valve stem with the tire mounted on the wheel. To visually identify a tire pressure sensor/valve stem, the valve stem cap is longer than a standard valve stem. This vehicle uses the 433 MHz TPM sensor. Although 315 MHz and 433 MHz sensors are identical in size and shape, they are not interchangeable. Always make sure the correct sensor is being used. A TPM/RKE ANALYZER 2046300080 can be used to determine the sensor's frequency without having to dismount the tire.

The battery operated tire pressure sensor is both a transmitter and a receiver. The TPM sensor can be forced to transmit if using a special tool such as a TPM/RKE ANALYZER 2046300080 Analyzer. The TPM/RKE ANALYZER 2046300080 Analyzer has the ability to change the sensor mode and to diagnose a faulty TPM sensor. Using a TPM/RKE ANALYZER 2046300080 Analyzer can take up to a minute to force a transmission from a sensor. Each sensor's (transmitter) broadcast is uniquely coded so that the module can monitor the state of each of the sensors on the four rotating road wheels. The module can automatically learn and store the sensor's ID while driving "within 10 minutes continuously above 24 km/h (15 mph)" after a sensor has been replaced. The vehicle must be stationary for more than 20 minutes in order to initiate the learning sequence. The sensor IDs can also be programmed using the TPM/RKE ANALYZER 2046300080 Analyzer Tool. Scan each TPM sensor at each road wheel, and store each Sensor ID in the correct location. (LEFT FRONT, LEFT REAR, RIGHT FRONT, and RIGHT REAR) Connect the TPM/RKE ANALYZER 2046300080 Analyzer Tool

to the scan tool. Then follow the programming steps outlined in the diagnostic scan tool for "Program Tire Pressure Sensor ID w/ TPM Tool".

The TPM sensor provides the following:

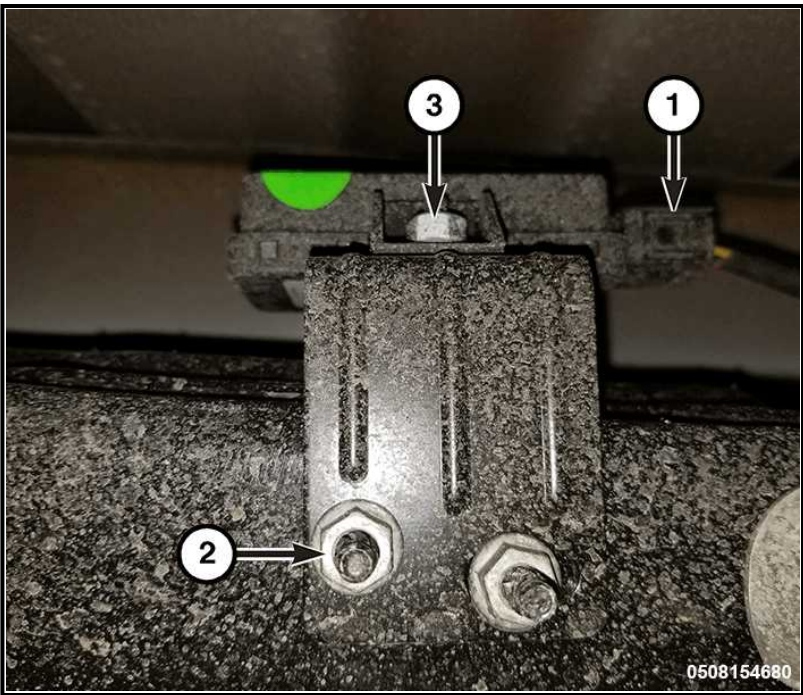
RF OUTPUTS

- Left Front TPM Sensor
- Left Rear TPM Sensor
- Right Front TPM Sensor
- Right Rear TPM Sensor
- Spare Tire TPM Sensor (if equipped)

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .



1 - Tire Pressure Monitor (TPM) Wire Harness Connector
2 - Module Bracket Fasteners
3 - Tire Pressure Monitor (TPM) Fasteners

3. Locate the Tire Pressure Monitor (TPM) module on the rear cross member and disconnect the wire harness connector.
4. Remove the two Tire Pressure Monitoring (TPM) module bracket nuts.
5. Remove the TPM module and bracket assembly.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

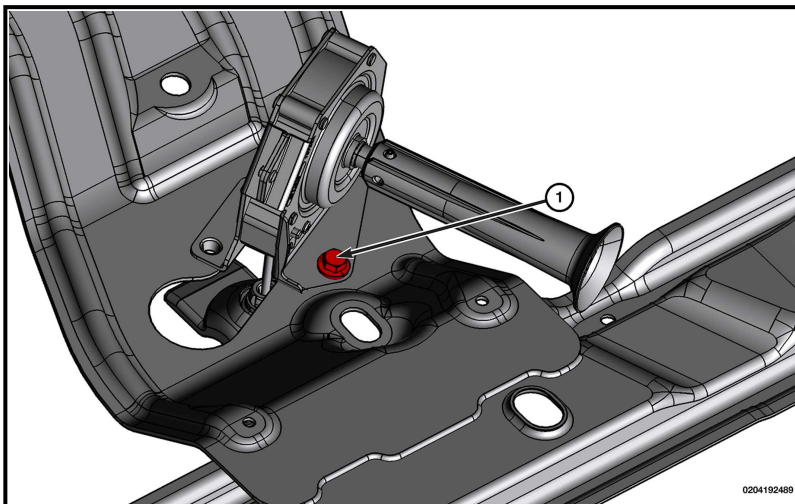
TORQUE SPECIFICATIONS

- Perform the TPM Diagnostic Verification Test. Refer to **STANDARD PROCEDURE** .

TIRE AND WHEEL



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Lug Nut	176 N. m (130 Ft. Lbs.)	-
-	Tire Pressure Monitoring (TPM) Module Bracket Fasteners	7 N. m (62 In. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Spare Tire Winch Bolt	20 N. m (15 Ft. Lbs.)	-

MODULE PROGRAMMING

Perform Tire Pressure Monitoring (TPM) system module programming as needed.

Using (special tool #2046300080, Kit, TPM/RKE ANALYZER) and the scan tool, navigate to the TPM system module and then its "Miscellaneous Functions" menu to select and perform the following procedures:

1. Program Left Front Tire Sensor ID
2. Program Left Rear Tire Sensor ID
3. Program Right Front Tire Sensor ID
4. Program Right Rear Tire Sensor ID

MODULE, TRANSMISSION CONTROL (TCM)

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION

The valve body internal to the transmission includes the Transmission Control Module (TCM), all solenoids and sensors, and can be referred to as the Transmission Control Module Assembly (TCMA). The TCM is attached to the valve body between the transmission case and the valve body. If any component of the valve body **including the TCM** sensors or solenoids needs to be replaced, the complete TCMA (valve body) must be replaced. For further information of the TCMA. Refer to .

OPERATION

The valve body, which includes the Transmission Control Module (TCM), controls the delivery and pressure of transmission fluid. The TCM is integrated into the valve body. The TCM regulates the amount of hydraulic pressure used to engage the clutches and the Torque Converter Clutch (TCC), in addition to directing hydraulic pressure to engage or release any given clutch for any given required gear. The TCM will actuate the valves via solenoids based on the position of the shifter, transmission fluid temperature, engine operating conditions, traction conditions and driver demands. During a shift, the TCM will actuate the solenoids to match the gear ranges to the optimal torque range of the engine based on the position of the accelerator pedal, shifter and vehicle speed as determined by the Powertrain Control Module (PCM) based on input from the Vehicle Speed Sensor (VSS) signal from the Antilock Brake System (ABS) module. Due to the complexity of the transmission control system, always refer to the transmission electrical/electronic diagnostics in this section when attempting to diagnose transmission problems.

If the Transmission Control Module Assembly (TCMA) is replaced, it **must** be programmed and a drive learn needs to be performed before returning the vehicle to the customer.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

NOTE: New Transmission Control Modules (TCMs) are supplied with generic software. When replacing a TCM, it must be programmed with vehicle specific software.

NOTE: If this Electronic Control Unit (ECU) is being replaced with a new unit, use a diagnostic scan tool to perform the Flash Programming Procedure (if available).

For removal and installation of the Transmission Control Module Assembly (TCMA). Refer to [VALVE BODY, REMOVAL AND INSTALLATION](#) [VALVE BODY, REMOVAL AND INSTALLATION](#) .

MODULE PROGRAMMING

PROGRAMMING THE TRANSMISSION CONTROL MODULE (TCM)

PROGRAMMING THE TRANSMISSION CONTROL MODULE (TCM)

NOTE: New Transmission Control Modules (TCMs) are supplied with generic software. When replacing a TCM, it must be programmed with vehicle specific software.

NOTE: Failure to properly program the TCM will cause DTC(s) to be set.

NOTE: Always use a battery charger when programming any Electronic Control Unit (ECU).

1. The following conditions must be met during the reprogramming procedure:

- Battery must be maintained between 10 and 16 volts. Connect a battery charger if necessary.
 - Ambient temperature must be between 0B°C (32B°F) 60B°C (140B°F).
 - Gear Selector must be in PARK.
2. With the scan tool and Dealer Connect, download the appropriate TCM flash file to the scan tool.
 3. Turn the ignition on.
 4. Following the menu on the scan tool, program the TCM.
 5. Perform the Gearbox Replacement routine.
 6. Perform the TRANSMISSION VERIFICATION TEST Refer to the appropriate service information .

TRANSMISSION CONTROL MODULE (TCM) ADAPTATION - 8HP/RE

The TCM or Transmission Control Module Assembly (TCMA) controls each clutch pack's fluid pressure and fill time to give optimal shift quality. As the clutches wear, the TCM or TCMA will adapt and make adjustments to keep the shift quality consistent over the vehicle's life. The initial clutch filling pressure and fill times are set at the factory. When a transmission assembly or transmission component is replaced, or the adaptation values are reset, the adaptation values must be relearned. This procedure should also be followed when it is suspected that a vehicle has not been driven in a manner that encourages clutch adaptation learning in highway or city driving conditions.

NOTE: The scan tool for many 8-Speed Transmissions now has a **QUICK LEARN** or **STATIC ADAPTATION (STADA)** routine that should be performed if the customer has any shift quality concerns or after any internal repairs are performed on the transmission. The **TCM ADAPTATION PROCEDURES** below need to be performed under the following conditions: 1) The **QUICK LEARN**, or **STATIC ADAPTATION** routine is not available on the scan tool. 2) The shift quality concern is not corrected by performing the **QUICK LEARN** or **STATIC ADAPTATION** routine.

QUICK LEARN PROCEDURE

NOTE: The scan tool software must be at the newest revision to perform this procedure.

NOTE: The **QUICK LEARN PROCEDURE** requires that the Transmission fluid temperature be at least 55B°C (131B°F).

1. Drive the vehicle briefly to ensure all clutches have been engaged at least twice. Keep the engine running throughout the remainder of this procedure.
2. With the scan tool, activate the **RESET ADAPTIVE VALUES** routine.
3. With the scan tool, activate the **QUICK LEARN** routine and follow the on-screen instructions. This procedure requires about 2-5 minutes to complete.

TCM ADAPTATION PROCEDURES

The two procedures to relearn these values are called Fast Filling Adaptation and Standard Clutch Filling Adaptation. Depending on the repair or complaint, one or both procedures must be performed as described below.

NOTE: Performing a reset of the Transmission Adaptation values does not automatically trigger the TCM to relearn the Adaptation values. If a reset is performed, both procedures must be performed to restore optimal shift quality. Do not reset these values unless specifically instructed to do so.

NOTE: This procedure does not need to be performed if the existing TCM or TCMA is re-flashed, and that was the only repair performed.

One or both TCM Adaptation procedures should be performed depending on the situation. Failure to perform these procedures when required, could cause shift quality issues.

Fast Filling Adaptation Procedure

Perform the following procedure when the TCM or TCMA, or Transmission assembly (with TCMA) is replaced or when adaptation values have been reset. This procedure should be performed before performing the Standard Clutch Filling Adaptation Procedure when these components are replaced.

NOTE: Perform this procedure on a smooth road surface. The TCM or TCMA will abort the adaptation process if it senses rough road conditions. The road should be clear of traffic due to the start, stop, and slow vehicle speeds required during this procedure.

1. With the Scan Tool, erase Diagnostic Trouble Codes (DTCs).
2. Setup the scan tool to display the Transmission Oil Temperature, Torque, Turbine (Input) Speed Sensor rpm, and Clutch 'X' - Filling Counter for each clutch.
3. Drive the vehicle until the Transmission Oil Temperature is above 30B° C (86B° F).
4. Stop the vehicle.
5. Drive the vehicle to perform upshifts for all gears under the following conditions:
 - Light to medium throttle position
 - Turbine (Input) Speed between 1, 250 - 2, 000 rpm
 - Torque between 100 N.m and 150 N.m (74 ft. lbs. and 111 ft. lbs.)
6. Release the throttle (0% position) to coast and allow a 6-5 down-shift.
7. Perform steps 4-6 until the Filling Counters for each clutch displays 10 counts.

The tables below may be used as an alternate reference for the optimal conditions required to learn the Fast Filling Adaptations.

Fast Filling Adaptation Conditions Table

Conditions Where Fast Filling Adaptations Occur			
Condition	Transmission Temperature	Torque N.m (ft. lbs.)	Input Speed (rpm)
Upshifts	Between 30B° C and 100B° C (86B° F and 212B° F)	Between 100 N.m and 150 N.m (74 ft. lbs. and 111 ft. lbs.)	Between 1250 and 2000 rpm
6-5 Downshifts for B Clutch	Between 30B° C and 100B° C (86B° F and 212B° F)	Between negative (-) 60 N.m and negative (-) 40 N.m (negative (-) 44 ft. lbs. and negative (-) 30 ft. lbs.)	Between 750 and 1100 rpm

Clutch vs Shift Table

Shifts Where Each Clutch Will Fast Adapt					
B	A Clutch	B Clutch	C Clutch	D Clutch	E Clutch
Shift	6 - 7	6 - 5	2 - 3 and 4 - 5	3 - 4	1 - 2 and 5 - 6
Optimal conditions under which adaptation learning occurs.	Best performed at highway speeds in excess of 80 km/h (50 mph).	Coasting with throttle at 0% position.	Best performed at light to medium-throttle - normal vehicle launch.	Best performed at light to medium-throttle - normal vehicle launch.	Best performed at light to medium-throttle - normal vehicle launch.

8. Perform the Standard Clutch Filling Adaptation Procedure.

Standard Clutch Filling Adaptation Procedure

Perform the following procedure when a Transmission internal component, Torque Converter, TCM or TCMA, or Transmission has been replaced, or when the adaptation values have been reset. This procedure should also be performed if it is suspected that the vehicle has not been driven in a manner that encourages clutch adaptation learning in highway or city driving conditions.

NOTE: Perform this procedure on a smooth road surface. The TCM or TCMA will abort the adaptation process if it senses rough road conditions. The road should be clear of traffic due to the start, stop, and slow vehicle speeds required during the procedure.

NOTE: The TCM learns the Standard Clutch Filling Adaptation values when the applicable clutch is not applied.

1. With the Scan Tool, erase DTCs.
2. Setup the scan tool to display the Transmission Oil Temperature, Torque, Turbine (Input) Speed Sensor rpm, and Clutch 'X' - Fast Filling Counter for each clutch.
3. Drive the vehicle until the Transmission Oil Temperature is above 50B° C (122B° F).

NOTE: Adaptation learning will be aborted if the Transmission Oil Temperature is above 100B° C (212B° F).

4. Stop the vehicle.
5. Drive the vehicle using the paddle shifters or gear +/- buttons on the steering wheel to hold the transmission in the desired gear.

NOTE: First and second gears do not require a Standard Clutch Filling Adaptation procedure.

NOTE: If attempting to resolve a specific shift quality issue, use the Gear vs Clutch Table below to see which clutches require further adaptation. For instance, if a rough 2-1 downshift is noted, note that clutch C and clutch E are applying and releasing. Then use the Clutch vs Shift Table above to note that clutch C and clutch E require the adaptation procedure performed in 4th and 7th gear.

6. In 3rd gear, drive the vehicle within the following conditions until the Clutch D - Fast Filling Counter increments by one count:
 - Vehicle speed between 32-56 km/h (20-35 mph)
 - Turbine (Input) speed between 950 - 1750 rpm
 - Torque between 25 N.m - 180 N.m (18 ft. lbs. - 133 ft. lbs.)
7. In fourth gear, drive the vehicle within the following conditions until the Clutch C - Fast Filling Counter increments by one count:
 - Vehicle speed between 32-56 km/h (20-35 mph)
 - Turbine (Input) speed between 950 - 1750 rpm
 - Torque between 25 N.m - 120 N.m (18 ft. lbs. - 89ft. lbs.)

NOTE: Fifth gear does not require a Standard Clutch Filling Adaptation procedure.

8. In sixth gear, drive the vehicle within the following conditions until the Clutch A - Fast Filling Counter increments by one count:
 - Vehicle speed between 73-81 km/h (45-50 mph)

- Turbine (Input) speed between 950 - 1750 rpm
- Torque between 50 N.m - 120 N.m (37 ft. lbs. - 89ft. lbs.)

9. In seventh gear, drive the vehicle within the following conditions until the Clutch B- Filling Counter and Clutch E Fast Filling Counter each increment by one count:

- Vehicle speed between 73-81 km/h (45-50 mph)
- Turbine (Input) speed between 950-1750 rpm
- Torque between 50 N.m-120 N.m (37 ft. lbs.-89ft. lbs.)

The **Standard Clutch Filling Adaptation Conditions Table** below may be used as an alternate reference for the optimal conditions required to learn the Standard Clutch Filling Adaptations.

Standard Clutch Filling Adaptation Conditions Table

Steady State Gears And Conditions Where Each Clutch Will Adapt					
Clutch	Gear	Optimal Vehicle Speed	Input Speed (rpm)	Torque N.m (ft. lbs.)	Transmission Temperature
A Clutch	6th	73-81 km/h (45-50 mph).	Between 950 and 1750 rpm	Between 50 N.m and 120 N.m (37 ft. lbs. and 89 ft. lbs.)	Between 50B° C and 100B° C (122B° F and 212B° F)
B Clutch	7th	73-81 km/h (45-50 mph).	Between 950 and 1750 rpm	Between 50 N.m and 120 N.m (37 ft. lbs. and 89 ft. lbs.)	Between 50B° C and 100B° C (122B° F and 212B° F)
C Clutch	4th	32-56 km/h (20-35 mph).	Between 950 and 1750 rpm	Between 25 N.m and 120 N.m (18 ft. lbs. and 89 ft. lbs.)	Between 50B° C and 100B° C (122B° F and 212B° F)
D Clutch	3rd	32-56 km/h (20-35 mph).	Between 950 and 1750 rpm	Between 25 N.m and 180 N.m (18 ft. lbs. and 133 ft. lbs.)	Between 50B° C and 100B° C (122B° F and 212B° F)
E Clutch	7th	73-81 km/h (45-50 mph).	Between 950 and 1750 rpm	Between 50 N.m and 120 N.m (37 ft. lbs. and 89 ft. lbs.)	Between 50B° C and 100B° C (122B° F and 212B° F)

10. Perform steps 4-9 until the Fast Filling Counters for each clutch have incremented by at least five counts.

11. Evaluate shift performance for all gears. If the shift quality for any gear is insufficient, execute the appropriate driving conditions until shift quality improves. Incrementing the Fast Filling Counters by 12 counts for each clutch may be necessary to learn the adaptation values properly.

The following table Controller Area Network (CAN) be used to determine which clutches are involved in a specific up-shift or down-shift quality issue. 'X' indicates when a clutch is applied. The Standard Clutch Filling Adaptation learning occurs when the applicable clutch is not applied, and the transmission is in a steady state (not shifting).

Gear vs Clutch Table

Gear	Clutch A	Clutch B	Clutch C	Clutch D	Clutch E
1st	X	X	X	B	B
2nd	X	X	B	B	X
3rd	B	X	X	B	X
4th	B	X	B	X	X
5th	B	X	X	X	B
6th	B	B	X	X	X

Gear	Clutch A	Clutch B	Clutch C	Clutch D	Clutch E
7th	X	B	X	X	B
8th	X	B	B	X	X
Reverse	X	X	B	X	B

Read the information below for details regarding this procedure.

Reading Clutch Adaptation Data

The Clutch Packs will each have 4 scan tool data labels to observe under the TCM section. Using Clutch A as an example, the data labels are:

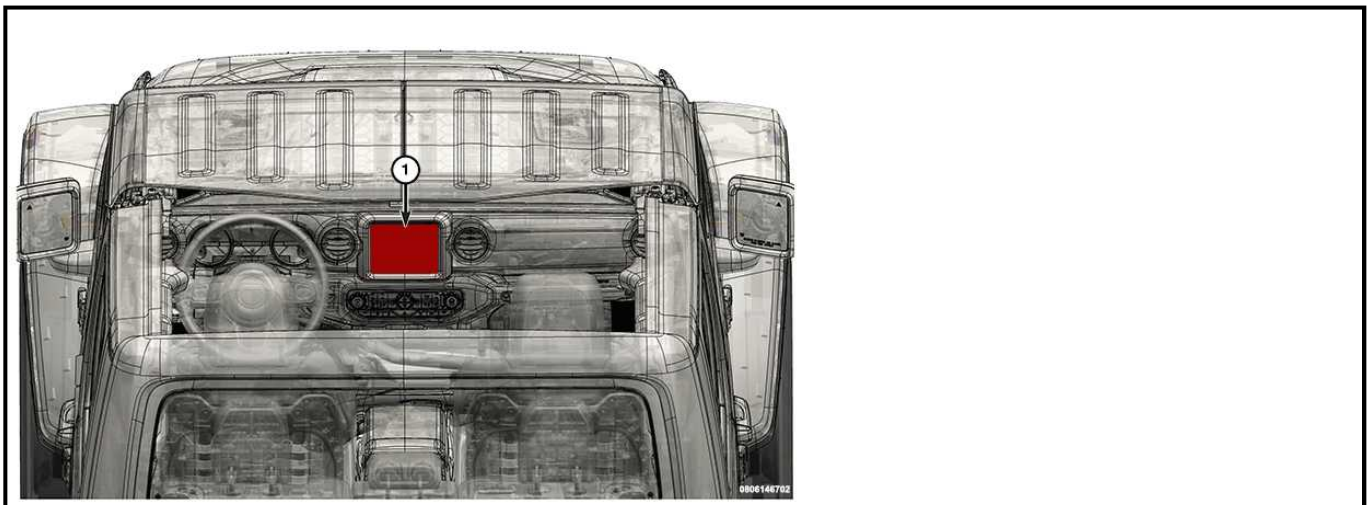
- **Clutch A- Fast Filling Counter:** This data label displays the number of Clutch Filling Pressure adaptations that have been performed. These adaptations are the first learned values on a new transmission or after clutch adaptation values are reset. You will need to allow 5 to 12 fast filling counts per clutch to learn the clutch adaptations properly. If the shift quality is sufficient after 5 counts, no further adaptation is necessary for that clutch.
- **Clutch A- Filling Counter:** This data label displays the number of Clutch Filling Time adaptations that have been performed. You will need to allow 5 to 12 filling counts per clutch to learn the clutch adaptations properly. If the shift quality is sufficient after 5 counts, no further adaptation is necessary for that clutch.
- **Clutch A- Filling Pressure:** This data label displays the clutch filling pressure value learned during the TCM Adaptation procedure. The TCM adaptation software will increase or decrease the clutch fluid filling pressure to improve shift performance. The clutch Filling Pressure value will change over the life of the transmission based first on initial transmission build variation and then due to normal clutch wear.
- **Clutch A- Filling Time:** This data label displays the clutch filling time value that is learned during the TCM Adaptation procedure. The TCM adaptation software will increase or decrease the Clutch Filling Time to improve shift performance. The clutch Filling Time value will change over the life of the transmission based first on initial transmission build variation and then due to normal clutch wear.

RADIO

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



There are three radios available in this vehicle, UconnectB® 3 with 5 inch display, UconnectB® 4 with 7 inch display, and UconnectB® 4C NAV with 8.4 inch display. Each radio has a distinct chassis design and is identified by a sales code. Some markets use a UconnectB® 4 NAV with 8.4 inch display in place of the UconnectB® 4C NAV with 8.4 inch display.

Hardwired circuitry connects the radio to the electrical system of the vehicle. These hardwired circuits are integral to several wire harnesses, which routes throughout the vehicle and retained by many different methods. These circuits may be connected to each other and to the vehicle electrical system through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

The radio cannot be adjusted or repaired. If the radio is damaged or ineffective, it must be replaced.

OPERATION

NOTE: **The Security Gateway Module (SGW) is the Controller Area Network (CAN) gateway between the radio, telematics modules, Data Link Connector (DLC) and the other vehicle CAN modules. An SGW failure could prevent the radio from powering up, telematics module from communicating or a scan tool from communicating with the vehicle. For additional information on the SGW, Refer to [MODULE, SECURITY GATEWAY \(SGW\), DESCRIPTION AND OPERATION](#).**

The radio receives fused B+ from a fuse located in the Power Distribution Center (PDC) and is grounded through a circuit in the body wire harness that is secured to the sheet metal behind the passenger kick panel at all times.

The radio becomes operational when it receives a wake up signal over the CAN-IHS data bus indicating the status of the ignition switch is ON or Accessory. For additional information on the operation of the radio or media system in the vehicle, see the heading for the appropriate audio system option in the User Guide or the Owner Service Information. See the UconnectB® web site (<https://www.driveuconnect.com/>) for more information, or refer to the **For Owners** link on the vehicle brand web site for copies of those publications.

The Security Gateway Module (SGW) is in the audio and telematics CAN systems to provide security against certain types of attacks and threats from the scan tool, telematics and entertainment buses, which can put the rest of the vehicle's buses at risk of intrusion. The SGW lies electrically between the vehicle on one side, and the Data Link Connector (DLC), telematics and entertainment systems on the other side. The main function is to gate messages from one bus to another. The SGW monitors the B+ Feed, switched ignition feed, CAN circuits, software and hardware for any concerns.

The radio uses a fender mounted mast antenna for AM/FM signal reception and, depending upon vehicle optional equipment, a middle sport bar mounted combination antenna that can receive Global Positioning System (GPS) and satellite radio signals. For additional information about the audio system and its components, Refer to [DESCRIPTION AND OPERATION](#) .

Certain markets use a windshield mounted Digital Audio Broadcast antenna and module for reception and amplification of digital audio broadcast radio signals.

Depending upon the audio system options, the radio can play audio from many different media sources. The media can be played by connecting the source to the audio system via a 3.5 millimeter auxiliary (AUX) port, a Universal Serial Bus (USB) port or through wireless BluetoothB® audio streaming. Refer to the UconnectB® web site (<https://www.driveuconnect.com/>) for compatibility information.

NOTE: **USB devices (for example, camera memory USB adaptors and others, excluding Apple products) must comply with the Mass Storage Device (MSD) standard. This remote USB port can provide power to the inserted device.**

The radio is used by the Rear View Camera (RVC) system to display the images projected by the RVC. For additional information about the RVC system without FVC, For additional information about the RVC with FVC. Refer to [DESCRIPTION AND OPERATION](#) . Refer to [DESCRIPTION AND OPERATION](#) .

The radio supports the Navigation system, if equipped, by displaying the data from the GPS satellites on the radio screen. For additional information about the Navigation system. Refer to [DESCRIPTION AND OPERATION](#) .

The radio is also used as the compass display for vehicles equipped with either the radio and integral compass or the stand alone compass module for radios that do not have the integral compass. If the vehicle did not have a radio when assembled at the factory, then the compass module data is displayed in the Instrument Panel Cluster (IPC). For additional information about the stand alone compass module, Refer to [DESCRIPTION AND OPERATION](#) .

REMOVAL AND INSTALLATION

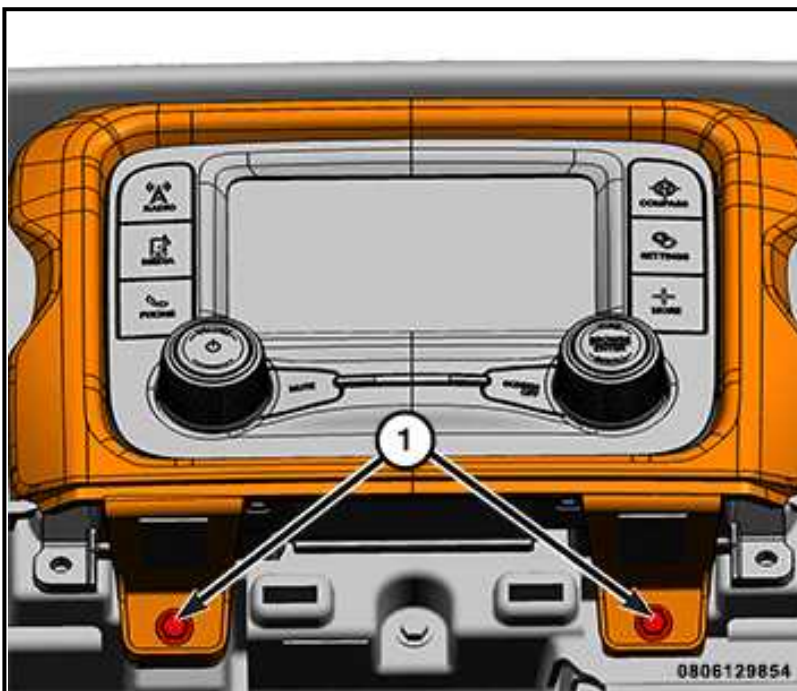
REMOVAL AND INSTALLATION

REMOVAL

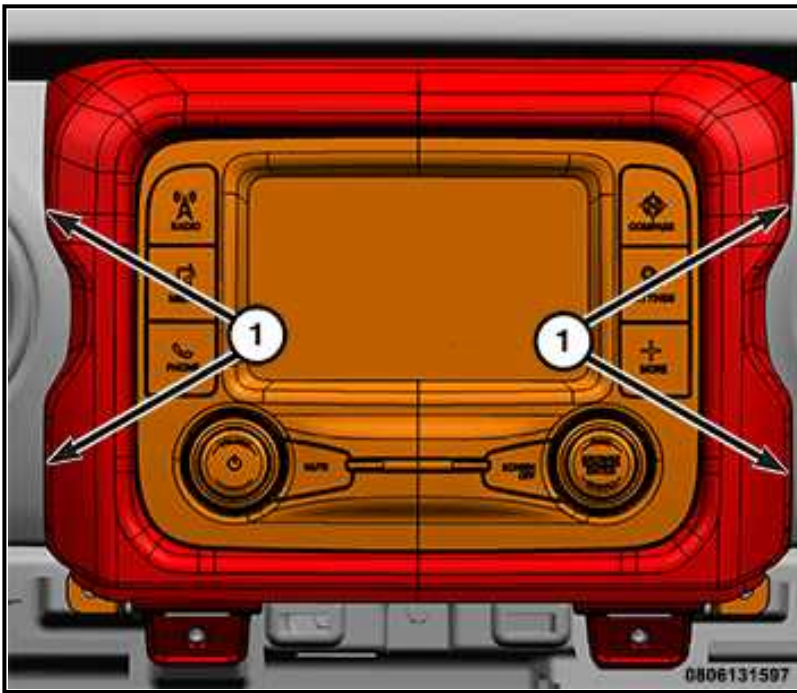
NOTE: If possible, the version of the map and Point Of Interest (POI) data should be noted before the original radio is replaced with a new unit. If the version of the map and POI data found on the new radio is not equal to or newer than the version that is found, updated data will need to be downloaded and installed to the new radio at the expense of the dealer. For the Navigation system restore and update procedures

Refer to [STANDARD PROCEDURE](#) .

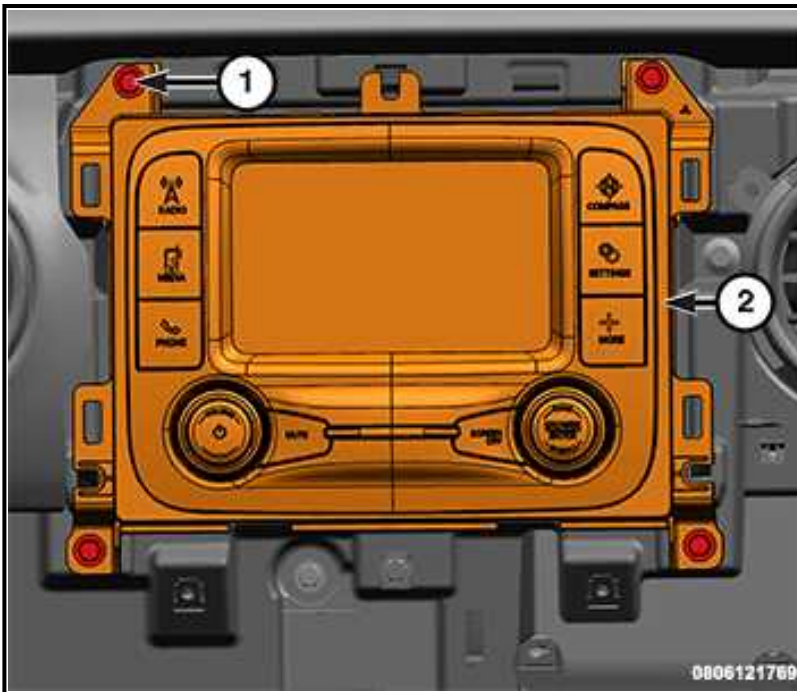
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the center trim panel from the instrument panel. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#) .



3. Remove the two screws (1) from the radio trim bezel.

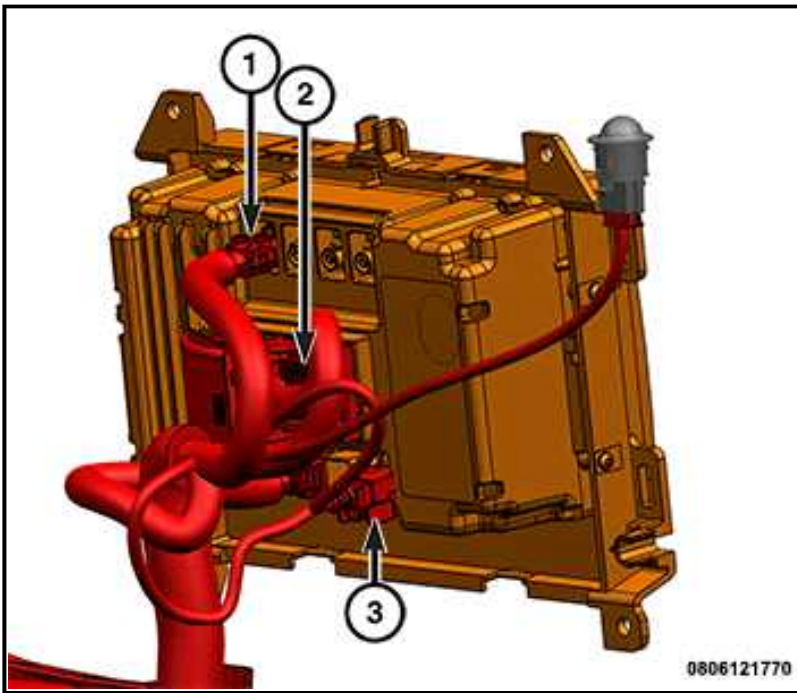


4. Using a trim tool, release the radio trim bezel retainers (1) that hold the bezel to the instrument panel.



5. Remove the four screws (1) securing the radio (2) to the instrument panel.

6. Pull the radio out far enough to access the back of the radio.



7. Disconnect the radio wire harness connectors (1, 2, 3).
8. Remove the radio from the instrument panel.

INSTALLATION

1. Position the radio near the instrument panel.
2. Connect the antenna cables and radio wire harness connectors.
3. Position the radio into the instrument panel.
4. Install and securely tighten the four screws securing the radio to the instrument panel.
5. Install the radio trim bezel to the instrument panel.
6. Install the two screws for the radio trim bezel and tighten securely.
7. Install the center trim panel to the instrument panel. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).
8. Connect the negative battery cable(s). Refer to the appropriate service information.

NOTE: UconnectB® Access Applications and WiFi hotspot will be automatically updated in the replacement radio through the radio's embedded cellular phone based on the customers present subscription status. This update process may take up to an hour, depending upon the number of apps and adequate cellular services accessibility. The dealer is not expected to perform this process or to oversee it, but may need to explain to the vehicle owner or operator that some features and applications may not be fully restored and overall system response may be slowed until the process has completed.

NOTE: Any factory replacement radio for the same vehicle will be provided with the Navigation system already activated. Refer to the Navigation/Telecommunication section for more information. Refer to [DESCRIPTION AND OPERATION](#).

2021 GENERAL INFORMATION

(Electronic Steering Lock Module (ESL) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1A92-11</u>	STEERING LOCK MOTOR-CIRCUIT SHORT TO GROUND
<u>B1A92-12</u>	STEERING LOCK MOTOR-CIRCUIT SHORT TO BATTERY
<u>B1A92-13</u>	STEERING LOCK MOTOR-CIRCUIT OPEN
<u>B1A92-71</u>	STEERING LOCK MOTOR-ACTUATOR STUCK
<u>B1A93-64</u>	STEERING LOCK MOTOR SENSOR-SIGNAL PLAUSIBILITY FAILURE
<u>B2100-64</u>	IGNITION RUN/START INPUT-SIGNAL PLAUSIBILITY FAILURE
<u>B2199-16</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B2199-17</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B22A9-01</u>	ECU INTERNAL PERFORMANCE-GENERAL ELECTRICAL FAILURE
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U1110-00</u>	LOST VEHICLE SPEED MESSAGE
<u>U1175-00</u>	LOST IGNITION STATUS MESSAGE
<u>U1412-62</u>	IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED-SIGNAL COMPARE FAILURE
<u>U1412-64</u>	IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED-SIGNAL PLAUSIBILITY FAILURE
<u>U1433-62</u>	IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL COMPARE FAILURE
<u>U1433-64</u>	IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL PLAUSIBILITY FAILURE
<u>U1517-62</u>	BODY CONTROLLER SECRET CODE-SIGNAL COMPARE FAILURE

DIAGNOSIS AND TESTING

B1A92-11-STEERING LOCK MOTOR-CIRCUIT SHORT TO GROUND

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to [MODULE, ELECTRONIC STEERING LOCK \(ESL\), REMOVAL AND INSTALLATION](#).
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).
- Test complete.

B1A92-12-STEERING LOCK MOTOR-CIRCUIT SHORT TO BATTERY

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [ELECTRONIC STEERING LOCK \(ESL\) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to [MODULE, ELECTRONIC STEERING LOCK \(ESL\), REMOVAL AND INSTALLATION](#).
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).
- Test complete.

B1A92-13-STEERING LOCK MOTOR-CIRCUIT OPEN

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [ELECTRONIC STEERING LOCK \(ESL\) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to **MODULE, ELECTRONIC STEERING LOCK (ESL), REMOVAL AND INSTALLATION**.
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.
- Test complete.

B1A92-71-STEERING LOCK MOTOR-ACTUATOR STUCK

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **ELECTRONIC STEERING LOCK (ESL) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE.**

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to **MODULE, ELECTRONIC STEERING LOCK (ESL), REMOVAL AND INSTALLATION**.
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.
- Test complete.

B1A93-64-STEERING LOCK MOTOR SENSOR-SIGNAL PLAUSIBILITY FAILURE

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **ELECTRONIC STEERING LOCK (ESL) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to [MODULE, ELECTRONIC STEERING LOCK \(ESL\), REMOVAL AND INSTALLATION](#).
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).
- Test complete.

B2100-64-IGNITION RUN/START INPUT-SIGNAL PLAUSIBILITY FAILURE

For a complete FUSES RELAY wiring diagram, **refer to the appropriate wiring information** .

For a complete GROUNDS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects the voltage on the Run/Start Relay Output circuit is not within specification.

POSSIBLE CAUSES

Possible Causes
RUN/START RELAY OUTPUT CIRCUIT SHORTED TO BATTERY
RUN/START RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [ELECTRONIC STEERING LOCK \(ESL\) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE (F915) RUN/START RELAY OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

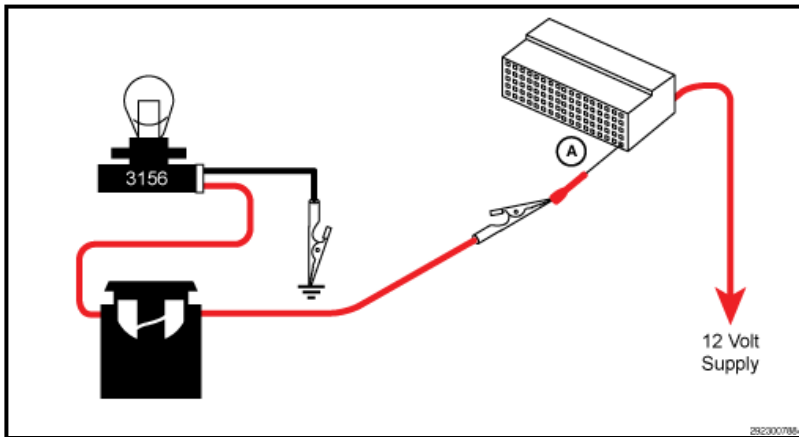
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared

to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**

3. CHECK THE (Z911) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

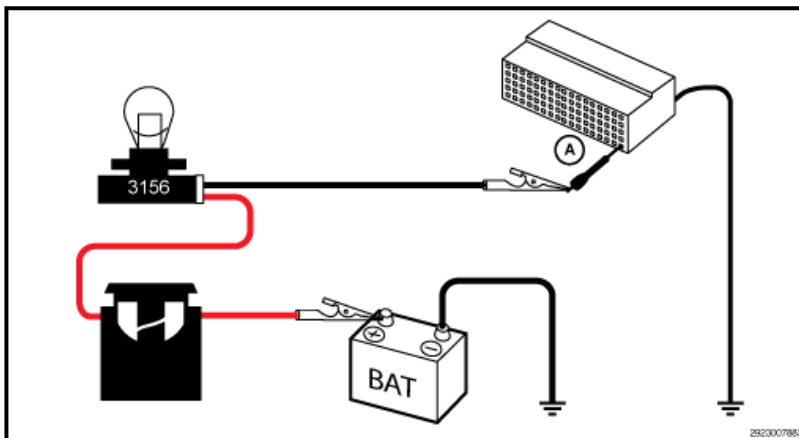
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).

4. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to [**MODULE, ELECTRONIC STEERING LOCK \(ESL\), REMOVAL AND INSTALLATION**](#).
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).
- Test complete.

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete FUSES wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects a low voltage condition on the Fused B(+) circuit.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE CHARGING SYSTEM CONCERN FUSED B(+) HIGH RESISTANCE ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.

2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Diagnose the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)
- **CHECK THE (A230) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
 1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
 2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
 3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
 4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
 5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

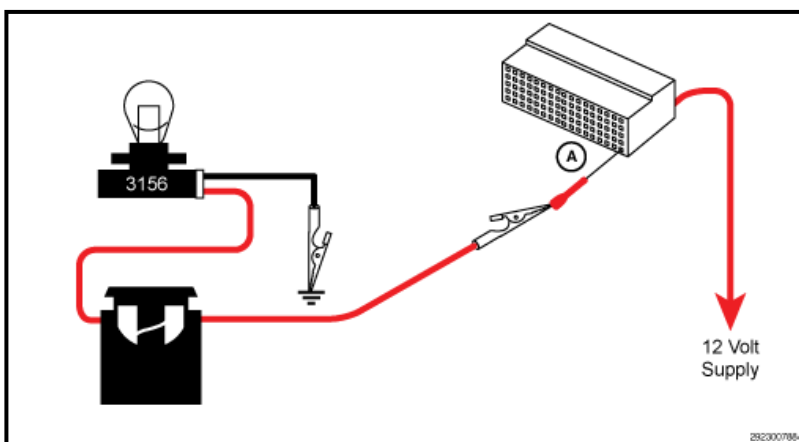
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).
- **CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS**
 1. Disconnect all ESL Module harness connectors.
 2. Disconnect all related in-line harness connections (if equipped).
 3. Disconnect the related component harness connectors.
 4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to [**MODULE, ELECTRONIC STEERING LOCK \(ESL\), REMOVAL AND INSTALLATION**](#).
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).
- Test complete.

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

- This diagnostic runs continuously when the engine is on.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects a high voltage condition on the Fused B(+) circuit.

POSSIBLE CAUSES

Possible Causes
GENERATOR OPERATION ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [ELECTRONIC STEERING LOCK \(ESL\) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)
- **CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS**
 1. Disconnect all ESL Module harness connectors.
 2. Disconnect all related in-line harness connections (if equipped).
 3. Disconnect the related component harness connectors.
 4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to [MODULE, ELECTRONIC STEERING LOCK \(ESL\), REMOVAL AND INSTALLATION](#) .
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST](#).
- Test complete.

THEORY OF OPERATION

The Electronic Steering Lock (ESL) Module prevents the Steering Wheel from turning when the Ignition Switch is in the OFF position or when the Immobilizer System does not receive the correct security code. A Lock/Unlock Motor inside the ESL Module incorporates a locking mechanism that locks or unlocks the steering wheel. The ESL Module communicates with several Electronic Control Units (ECUs) through the Controller Area Network (CAN) Bus network. The Anti-lock Brake System (ABS) Module provides a Vehicle Speed Signal to the ESL Module by way of a CAN Bus message. The Vehicle Speed Signal is used by the ESL Module to determine if the conditions are correct to lock the steering wheel. The Body Control Module (BCM) transmits the Lock/Unlock commands through CAN Bus messages to the ESL Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The system voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Electronic Steering Lock (ESL) Module detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRONIC STEERING LOCK (ESL) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [ELECTRONIC STEERING LOCK \(ESL\) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Electronic Steering Lock (ESL) Module DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK ESL MODULE AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all ESL Module harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all ESL Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ESL Module DTCs.

Did the DTC return?

Yes

- Replace the Electronic Steering Lock (ESL) Module in accordance with the Service Information. Refer to **MODULE, ELECTRONIC STEERING LOCK (ESL), REMOVAL AND INSTALLATION**.
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.

No

- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.
- Test complete.

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE:

This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX**.

U1110-00-LOST VEHICLE SPEED MESSAGE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Antilock Brake System - ABS) and the Reporting control module(s) that set this fault.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1175-00-LOST IGNITION STATUS MESSAGE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this fault.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1412-62-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED-SIGNAL COMPARE FAILURE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Antilock Brake System - ABS) and the Reporting control module(s) that set this fault.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1412-64-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED-SIGNAL PLAUSIBILITY FAILURE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Antilock Brake System - ABS) and the Reporting control module(s) that set this fault.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1433-62-IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL COMPARE FAILURE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this fault.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1433-64-IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED-SIGNAL PLAUSIBILITY FAILURE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this fault.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1517-62-BODY CONTROLLER SECRET CODE-SIGNAL COMPARE FAILURE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

STANDARD PROCEDURES

ELECTRONIC STEERING LOCK (ESL) PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For a complete wiring diagram, refer to appropriate SYSTEM WIRING DIAGRAMS article .

DIAGNOSTIC TEST

NOTE: Perform the following pre-diagnostic troubleshooting procedures prior to performing any diagnostic test.

NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and harness connector terminals related to the ESL Module for physical damage and corrosion. Make sure related ground circuits are clean and tight. Clean or repair as necessary.
2. Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.
3. With a Scan Tool, read PCM, BCM, ABS, and RFHM DTCs. Repair all Communication and Security DTCs prior to performing ESL Module diagnostic procedures.
4. With the scan tool, read and record all ESL Module DTCs. Record the ESL Module software version and variant ID (configuration or level).
5. If the ESL Module was recently replaced, make sure the ESL Module was properly programmed.
6. Check for Service Information Tune-ups or Technical Service Bulletins (TSB) that may apply.

Were there any repairs made that fixed the vehicle?

Yes

- Testing complete.
- Perform the Electronic Steering Lock (ESL) Verification Test. Refer to **ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST**.

No

- Perform the appropriate diagnostic procedure.

ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST

For a complete wiring diagram, refer to appropriate SYSTEM WIRING DIAGRAMS article .

ELECTRONIC STEERING LOCK (ESL) VERIFICATION TEST

1. CHECK THE FUSES AND ERASE DTCS

1. Connect any disconnected harness connectors.
2. Replace any blown fuses.

3. With the Scan Tool, erase DTCs.
4. Cycle the Ignition Switch from ON to OFF.
5. Start the Engine.

Does the Engine start?

Yes

- Go to [2](#)

No

- With the Scan Tool, read DTCs and refer to the appropriate Diagnostic Procedure.

2. CHECK THE STEERING WHEEL WITH THE ENGINE ON

1. Attempt to turn the steering wheel.

Does the steering wheel turn?

Yes

- Go To [3](#)

No

- With the Scan Tool, read DTCs and refer to the appropriate Diagnostic Procedure. If no DTCs are present, check for mechanical binding in the steering column and steering linkage. Refer to the appropriate Service Procedure.

3. CHECK THE STEERING WHEEL WITH THE IGNITION OFF

1. Turn the Ignition Switch OFF.
2. Attempt to turn the steering wheel.

Does the steering wheel turn?

Yes

- With the Scan Tool, read DTCs and refer to the appropriate Diagnostic Procedure. If no DTCs are present, inspect ESL Module locking pin for proper movement. Refer to the appropriate Service Procedure.

No

- Test is complete.

ELECTRONIC STEERING LOCK (ESL) PROGRAMMING PROCEDURE

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

ELECTRONIC STEERING LOCK ESL PROGRAMMING PROCEDURE

CHECK FOR AN ACTIVE DTC

NOTE: When replacing an ESL Module, the ESL Module must be programmed.

NOTE: Failure to properly program the ESL Module may result in the illumination of the Malfunction Indicator Lamp (MIL) and setting DTC(s).

NOTE: While performing the ESL Module programming procedure, the vehicle battery must be maintained between 10 and 16 volts. Ambient temperature must be between 0°C (32°F) 60°C (140°F). Vehicle must be in Park with brake pedal depressed.

1. Turn the Ignition ON, Engine not running.
2. With the scan tool, verify the ESL Module is communicating on the CAN BUS and it is not programmed.

NOTE: If the Scan Tool indicates that the ESL Module is already programmed, replace the ESL Module.

NOTE: If the Scan Tool can not communicate with the ESL Module, check the harness connections. If the harness connections are good, replace the ESL Module.

3. Following the menu on the scan tool, program the ESL Module.
4. With the scan tool, erase DTCs.
5. With the scan tool, read ESL Module DTCs.

Does the scan tool display any DTCs?

Yes

- Perform the appropriate diagnostic procedure(s).

No

- Test Complete
 - Perform the Electronic Steering Lock (ESL) Verification Test. Refer to [**ELECTRONIC STEERING LOCK \(ESL\) VERIFICATION TEST**](#).
-

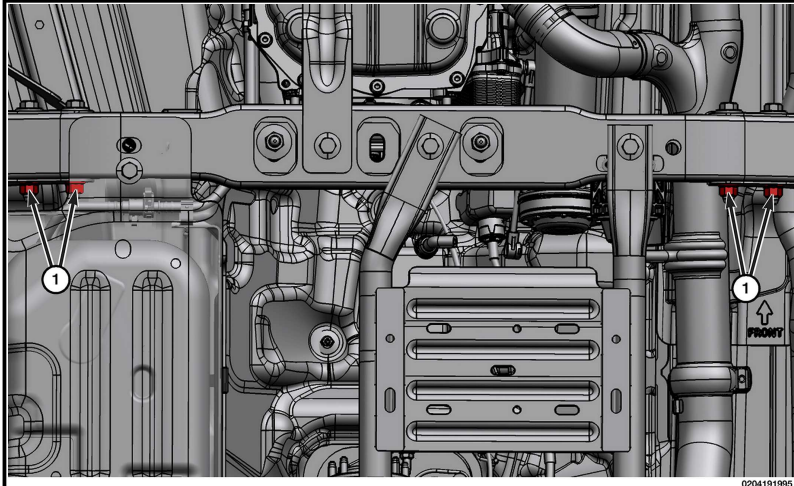
2021 ACCESSORIES AND BODY, CAB

Frame and Bumpers - Gladiator

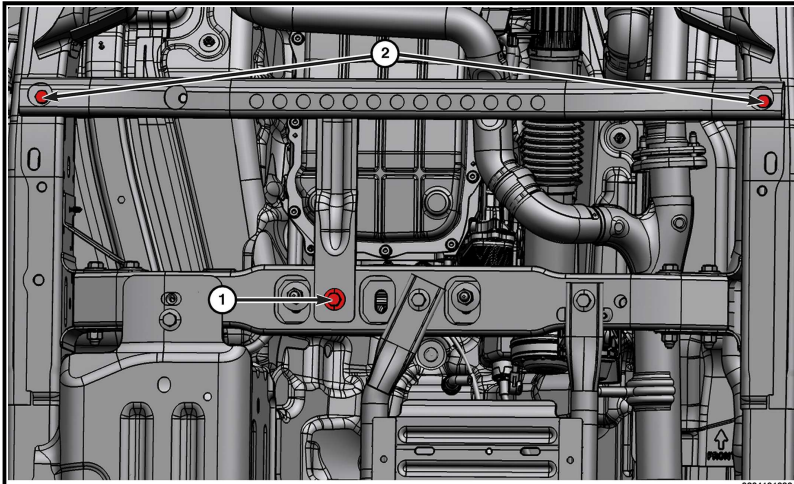
TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

CROSSMEMBER

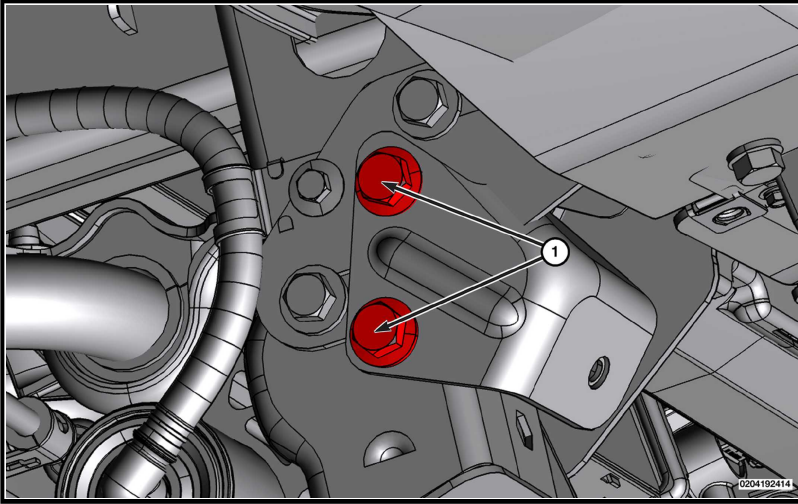


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Transmission Crossmember Frame Nuts	70 N.m (52 Ft. Lbs.)	-

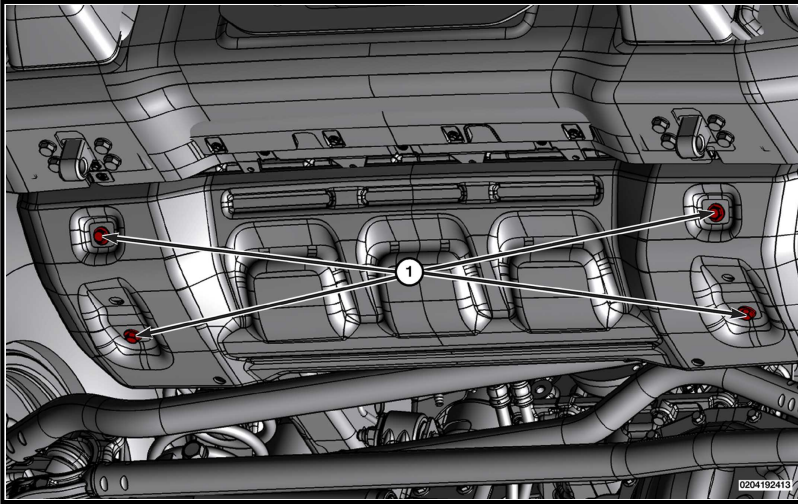


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Reinforcement Crossmember Bolt	75 N.m (55 Ft. Lbs.)	-
2	Front Reinforcement Crossmember Frame Bolt	75 N.m (55 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.

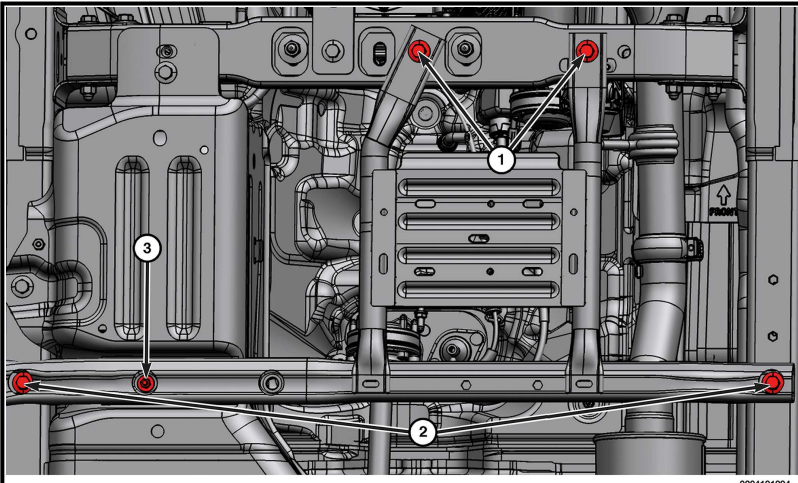
SKID PLATES



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bracket to Frame Bracket Bolts	50 N.m (37 Ft. Lbs.)	-

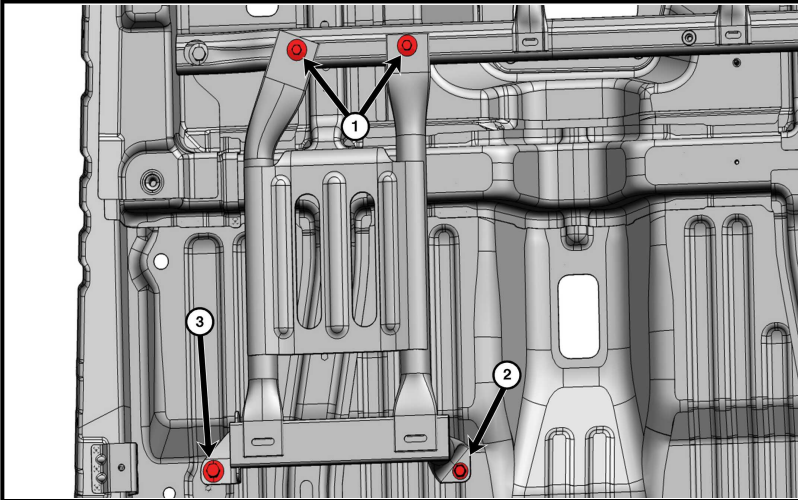


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bolts	25 N.m (18 Ft. Lbs.)	-



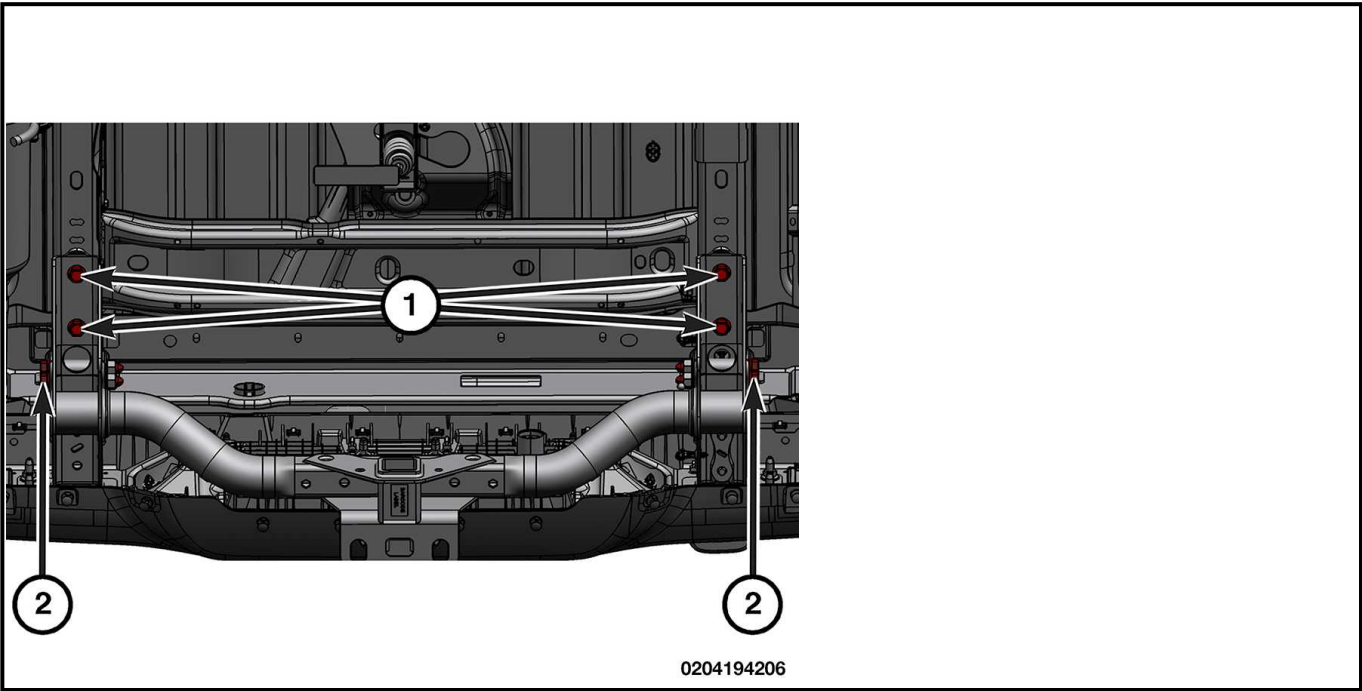
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Transfer Case Skid Plate Bolts	75 N.m (55 Ft. Lbs.)	-
2	Transfer Case Skid Plate Frame Bolts	75 N.m (55 Ft. Lbs.)	-

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
3	Transfer Case Skid Plate Fuel Tank Nut	20 N.m (15 Ft. Lbs.)	-

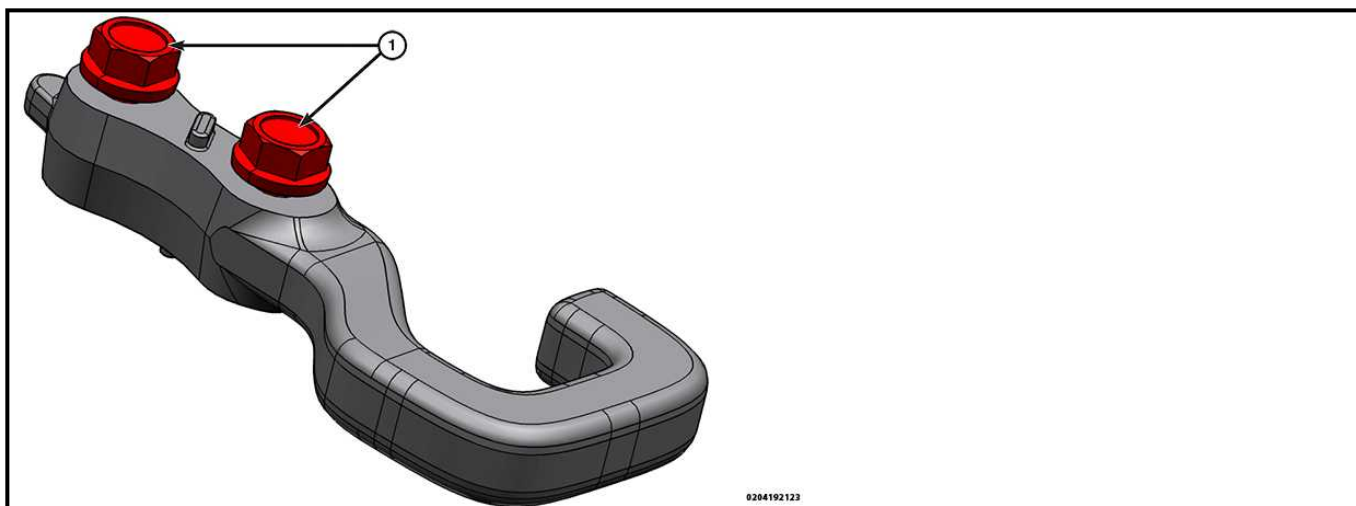


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	SCR Skid Plate Front Bolts	23 N.m (17 Ft. Lbs.)	-
2	SCR Skid Plate Outer Bolt	62 N.m (46 Ft. Lbs.)	-
3	SCR Skid Plate Inner Bolt	75 N.m (55 Ft. Lbs.)	-

TRAILER HITCH AND TOW HOOK



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Trailer Hitch Frame Bolts	165 N.m (122 Ft. Lbs.)	-
2	Trailer Hitch Bolts	170 N.m (125 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Tow Hook Bolts	48 N.m (35 Ft. Lbs.)	-
2	Front Tow Hook Bracket Nut	48 N.m (35 Ft. Lbs.)	-
3	Front Tow Hook Nut	25 N.m (18 Ft. Lbs.)	-

BUMPERS

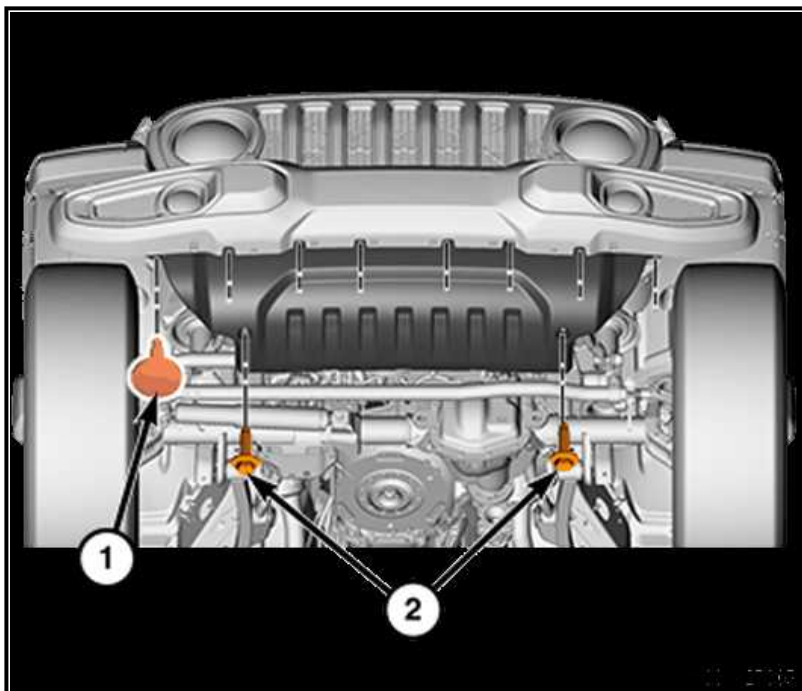
AIR DAM, FRONT

REMOVAL AND INSTALLATION

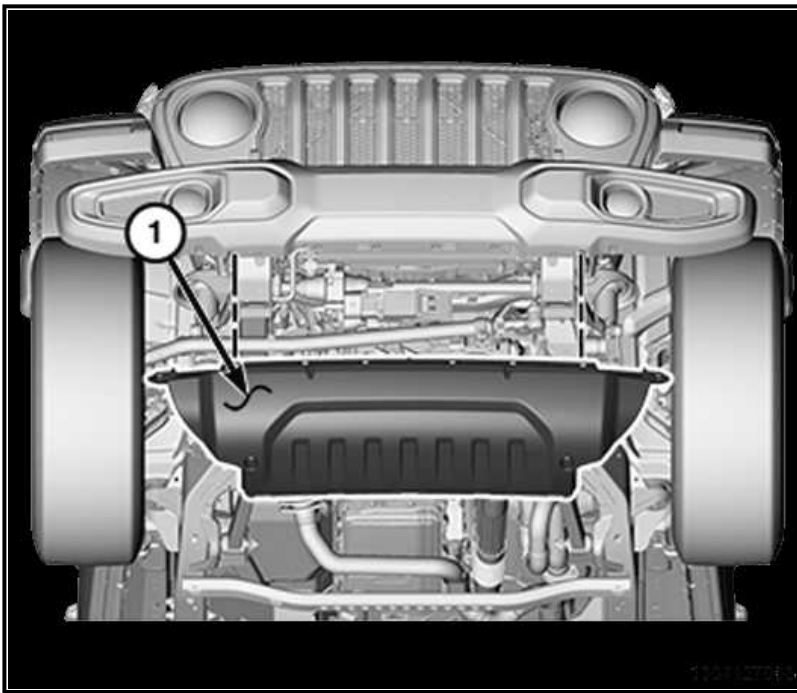
AIR DAM

REMOVAL

1. Raise and support the vehicle Refer to [HOISTING, STANDARD PROCEDURE](#) .



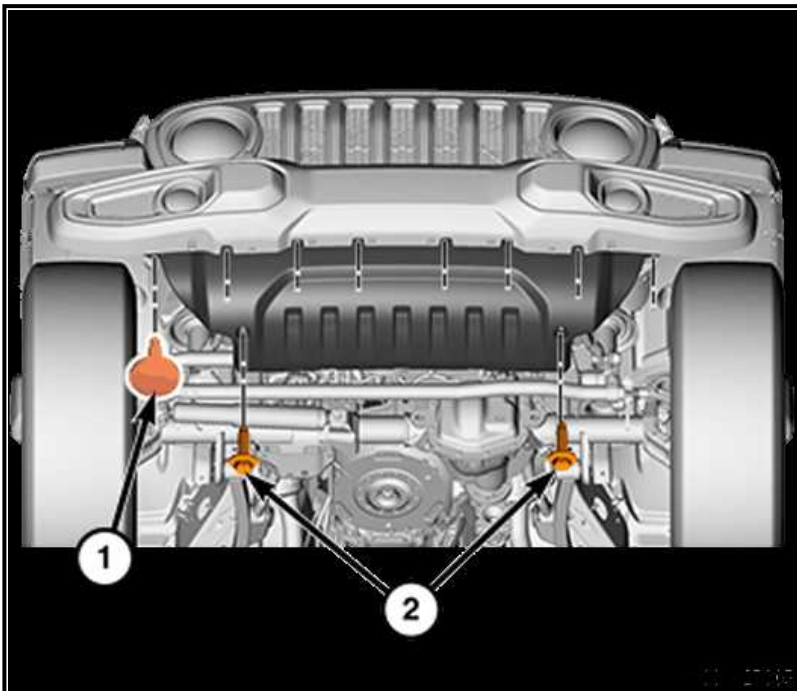
2. Remove the eight push pin fasteners (1).
3. Remove the bolts (2).



4. Remove the air dam (1).

INSTALLATION

1. Install the air dam (1).

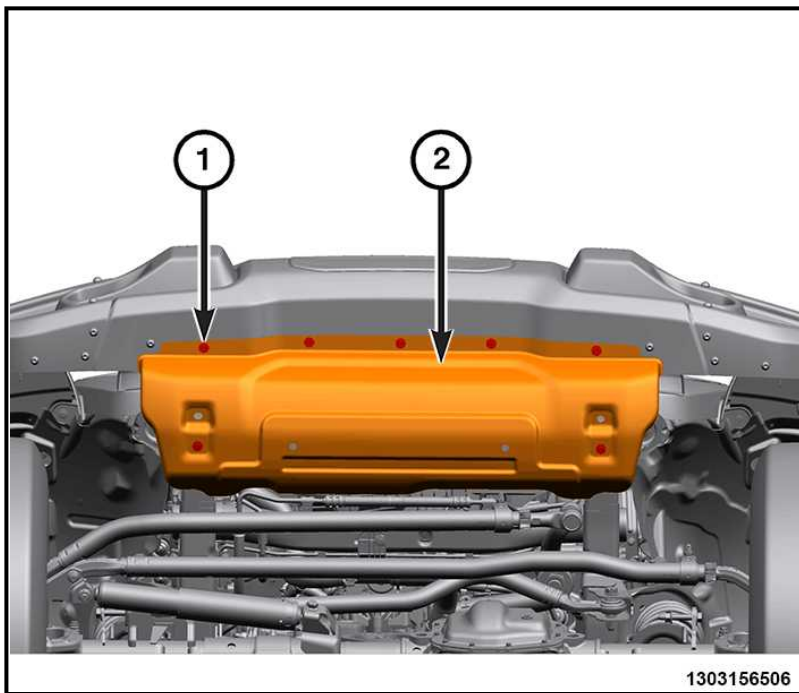


2. Install the eight push pin fasteners (1).
3. Install and securely tighten the bolts (2).
4. Remove the supports and lower the vehicle.

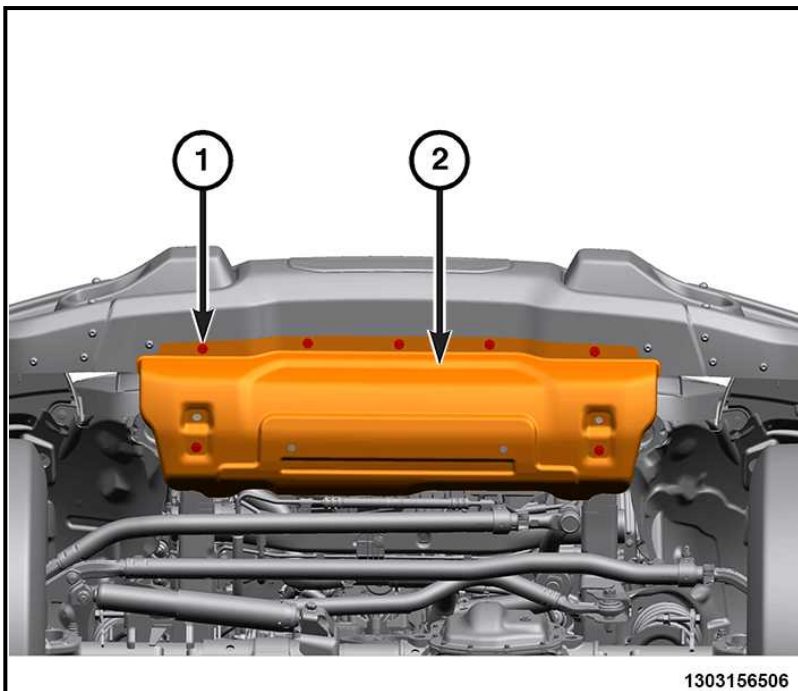
LOWER CLOSEOUT PANEL

REMOVAL

1. Raise and support the vehicle Refer to [HOISTING, STANDARD PROCEDURE](#) .



2. Remove the fasteners (1).
3. Remove the lower closeout panel (2).



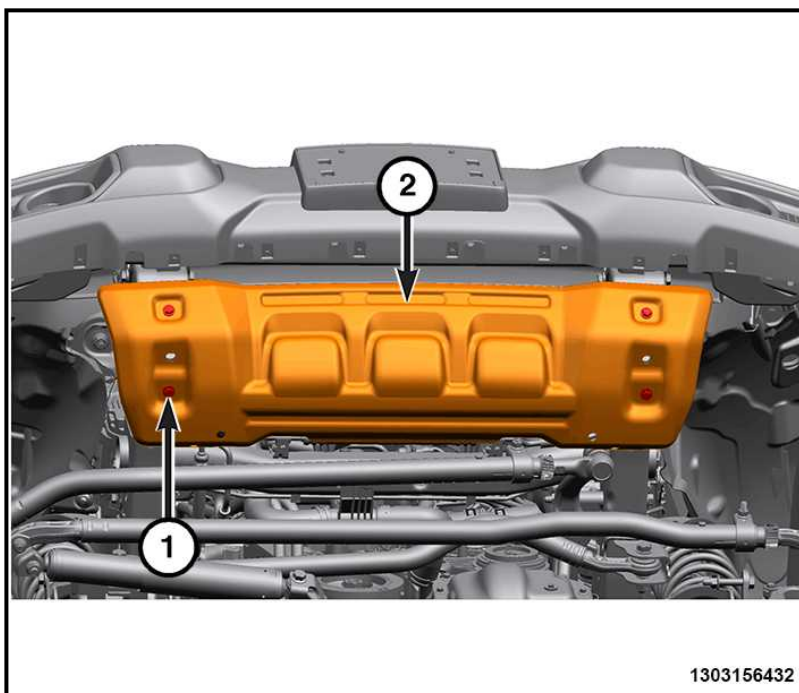
INSTALLATION

1. Install the lower closeout panel (2).
2. Install the fasteners (1) and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
3. Remove the supports and lower the vehicle.

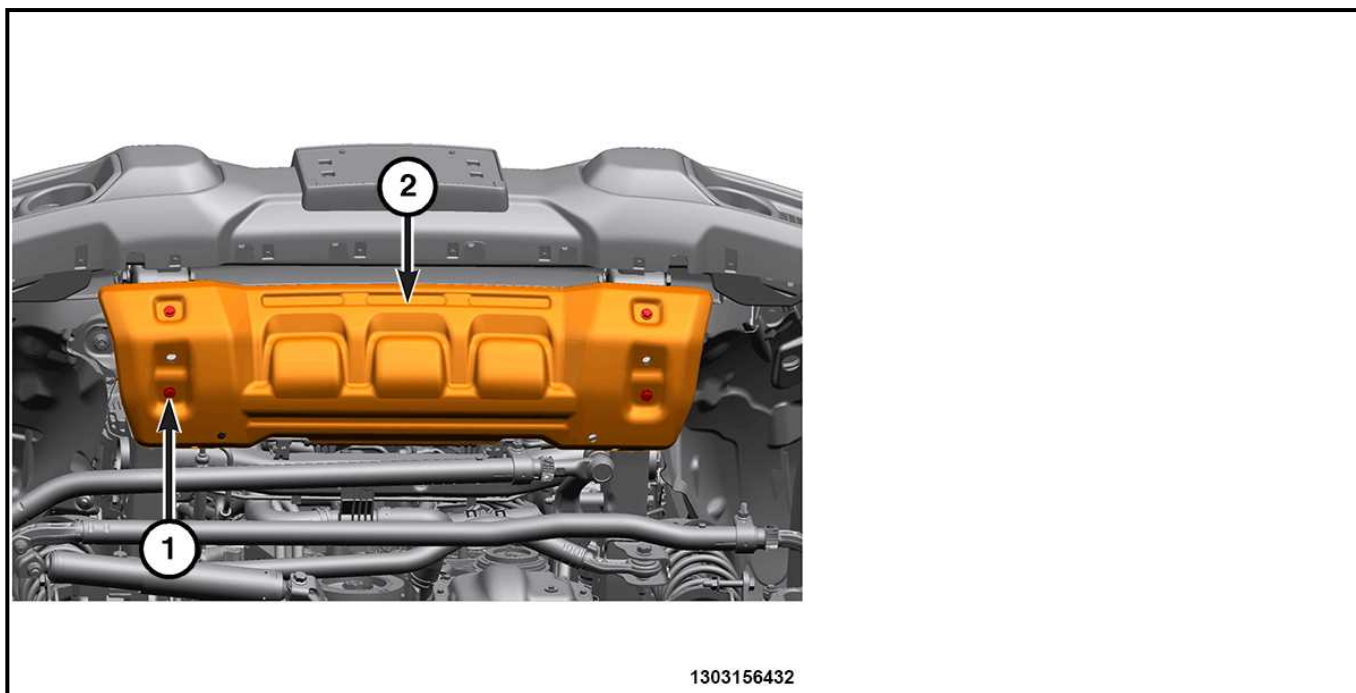
SKID PLATE

REMOVAL

1. Raise and support the vehicle Refer to [HOISTING, STANDARD PROCEDURE](#) .



2. Remove the fasteners (1).
3. Remove the skid plate (2).



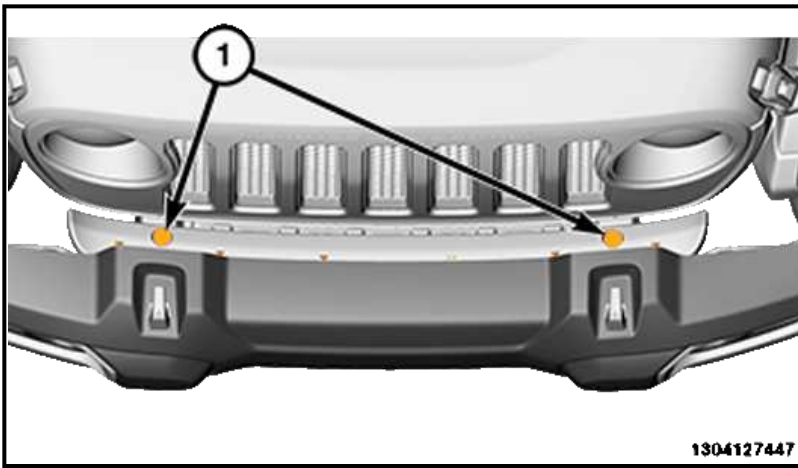
INSTALLATION

1. Install the skid plate (2).
2. Install and securely tighten the fasteners (1).
3. Remove the supports and lower the vehicle.

BUMPER, FRONT

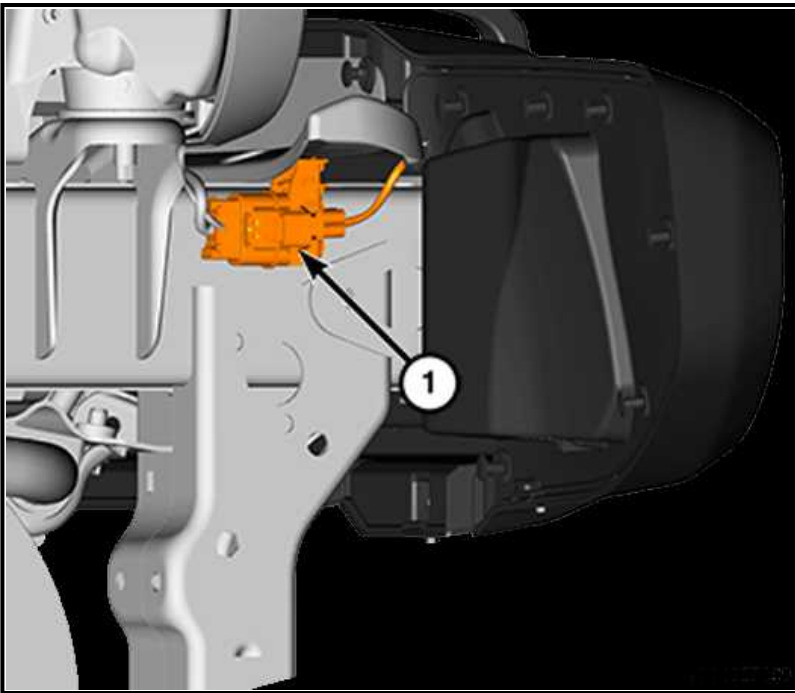
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

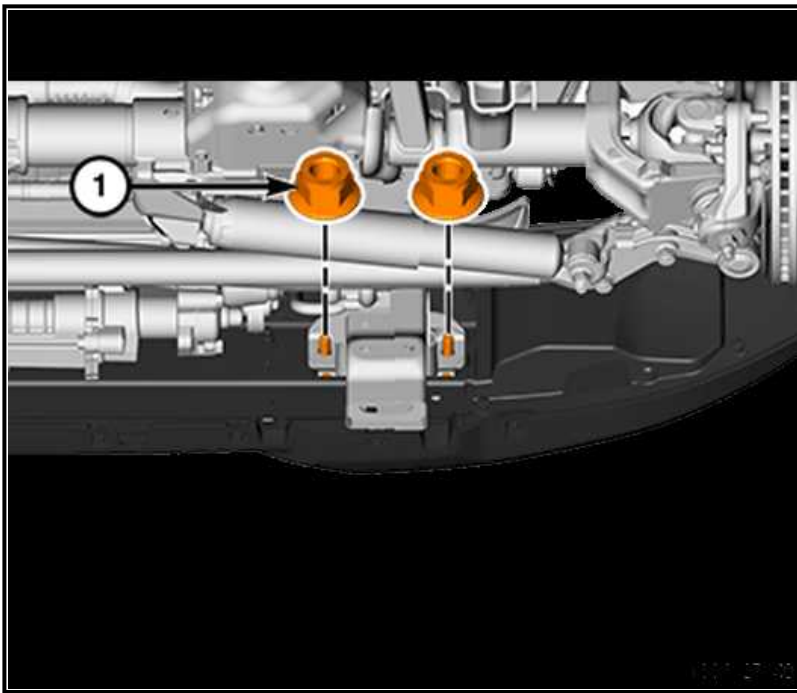


REMOVAL

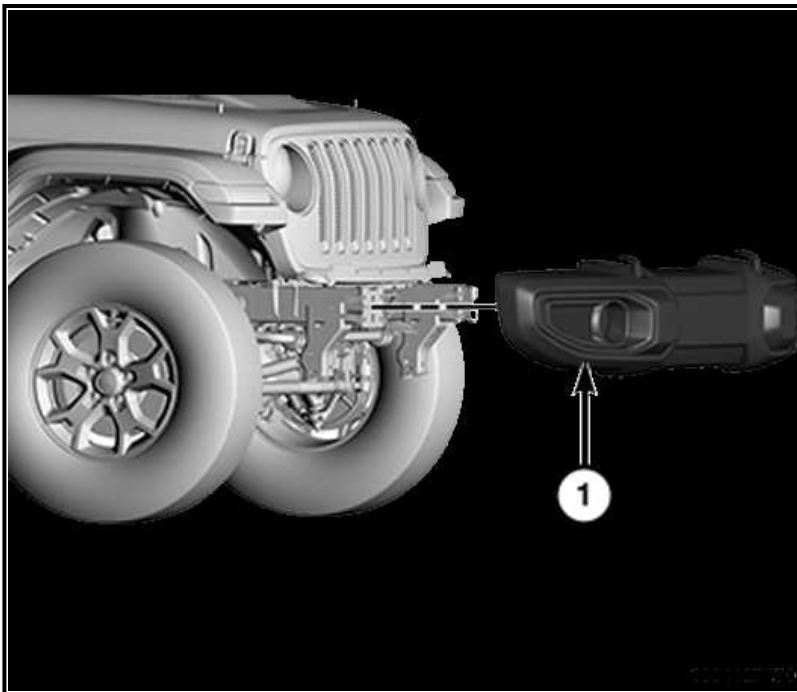
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. From the top of the bumper, remove the push pin fasteners (1) securing the closeout panel to the frame tips.
3. Remove the air dam Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION.](#)



4. Disconnect the wire harness connector (1).



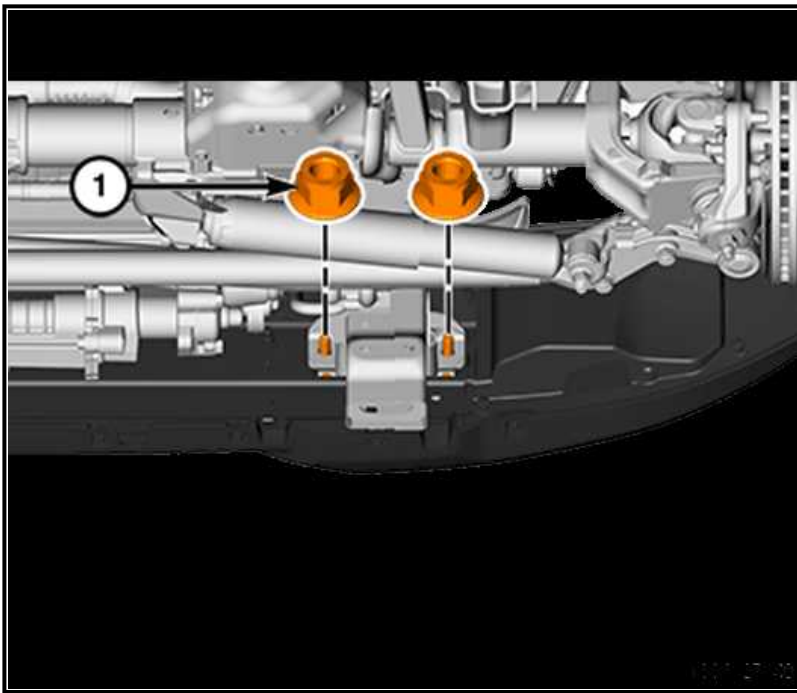
5. Remove the four bumper frame nuts (1).



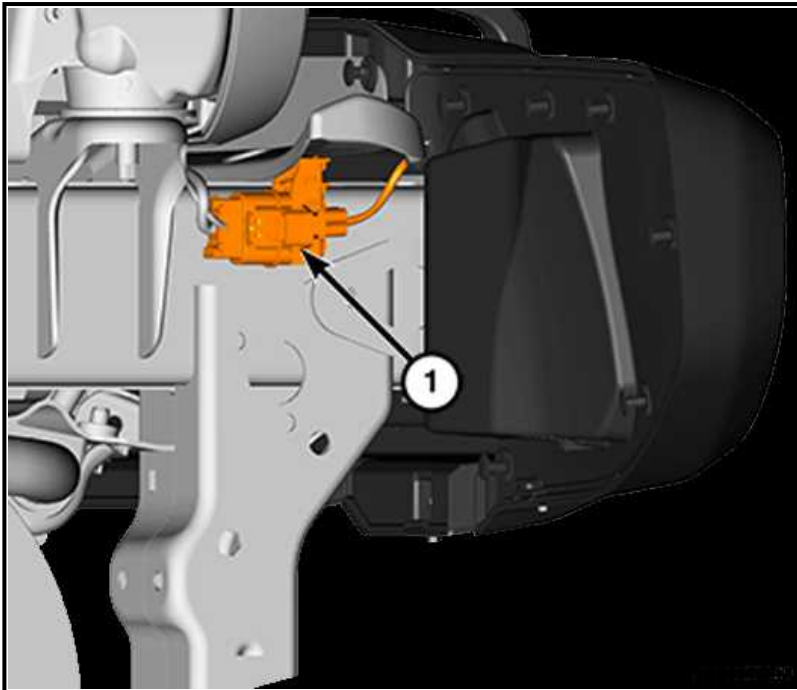
6. Remove the bumper assembly (1).

INSTALLATION

1. Install the bumper assembly (1) back onto the vehicle.

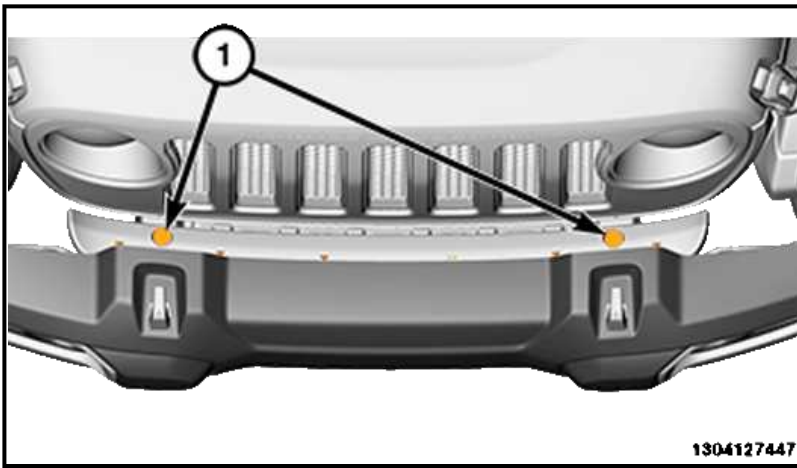


2. Install the four bumper frame nuts (1) and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#)



3. Connect the wire harness connector (1).

4. Install the air dam Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION](#).

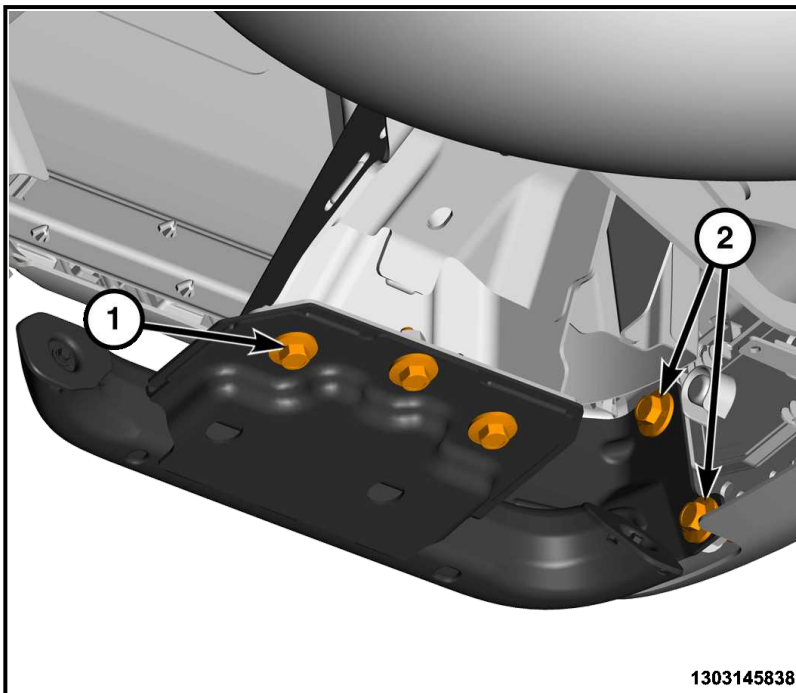


5. From the top of the bumper, install the push pin fasteners (1) securing the closeout panel to the frame tips.
6. Connect the negative battery cable. If equipped with an Intelligent Battery Sensor (IBS), connect the IBS connector.

BUMPER, REAR

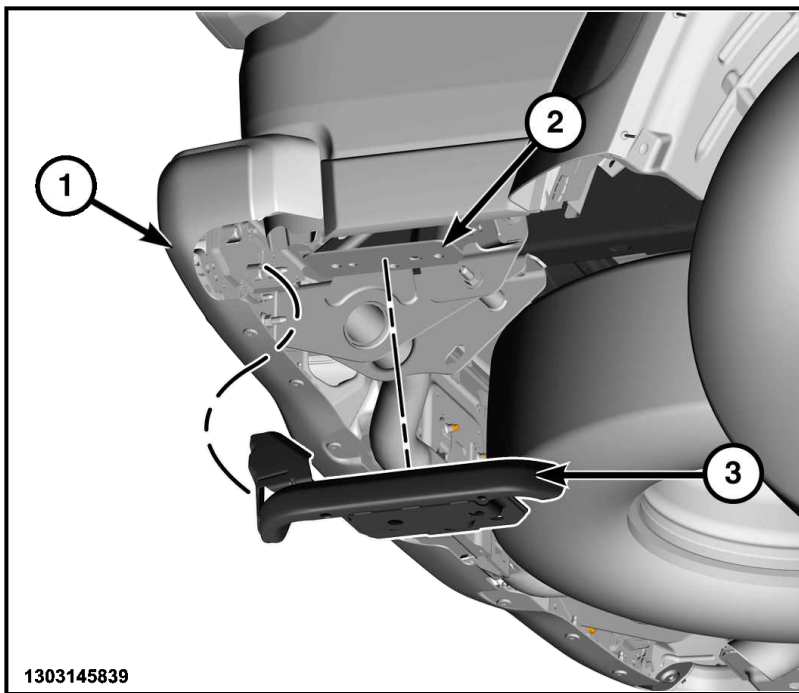
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

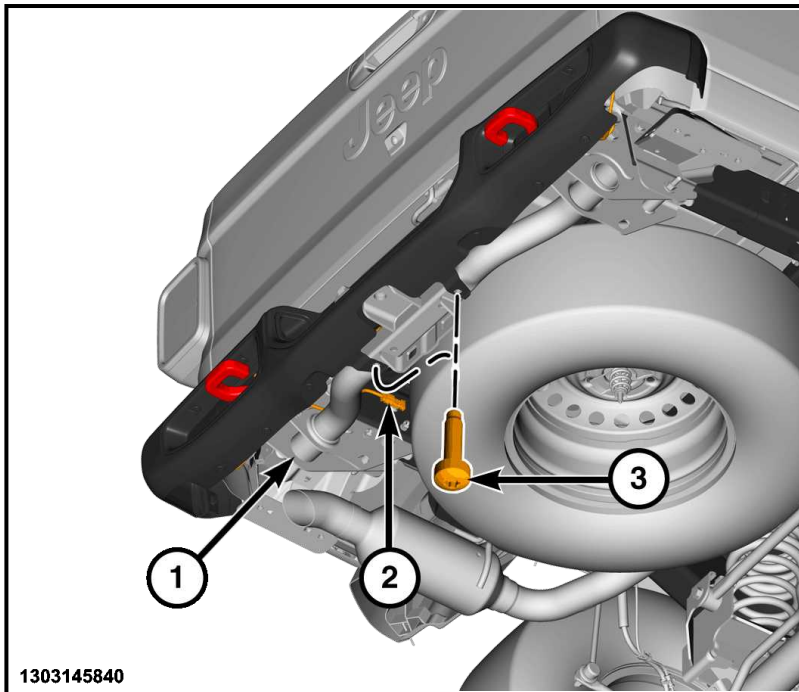


REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle Refer to [HOISTING, STANDARD PROCEDURE](#) .
3. Remove and discard the bumper guard support bolts (1).
4. Remove and discard the bumper guard to bumper bolts (2).

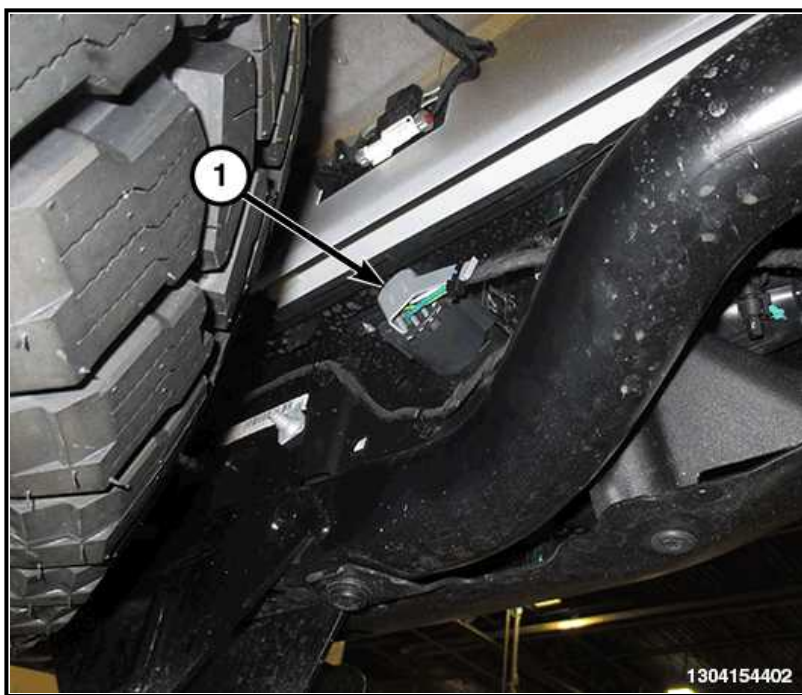


5. Remove the bumper guards (3).

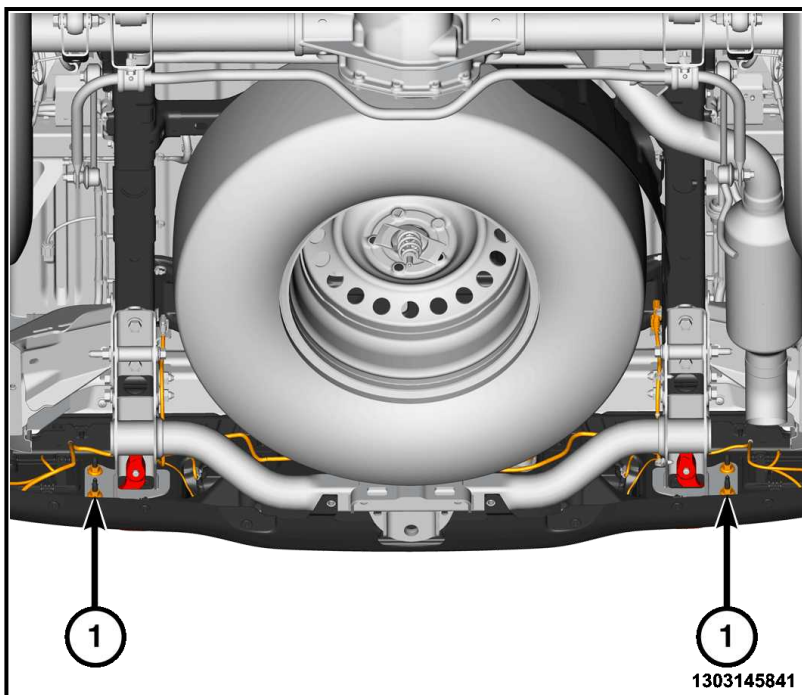


6. Remove the bottom bolts (3) from the trailer hitch (1).

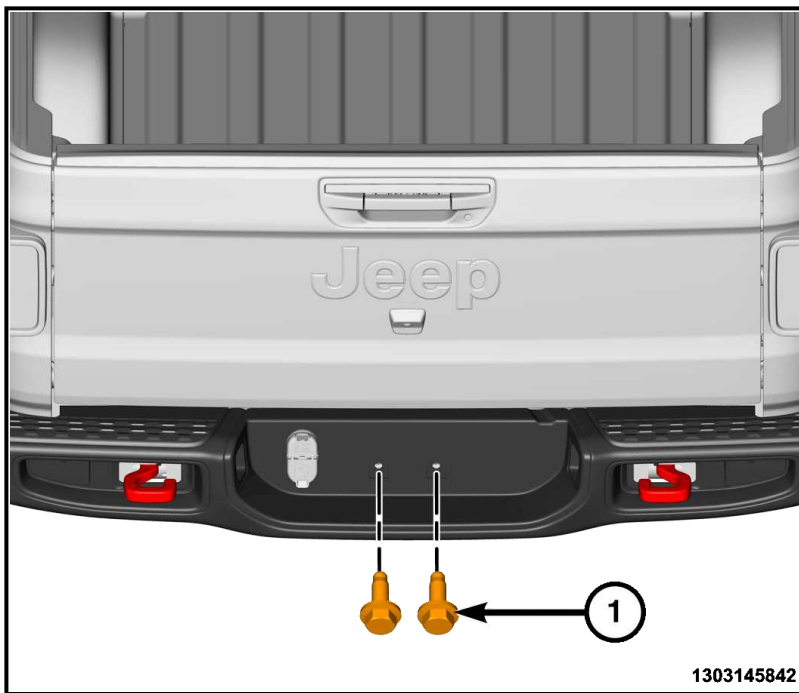
7. Disconnect the wire harness connectors (2).



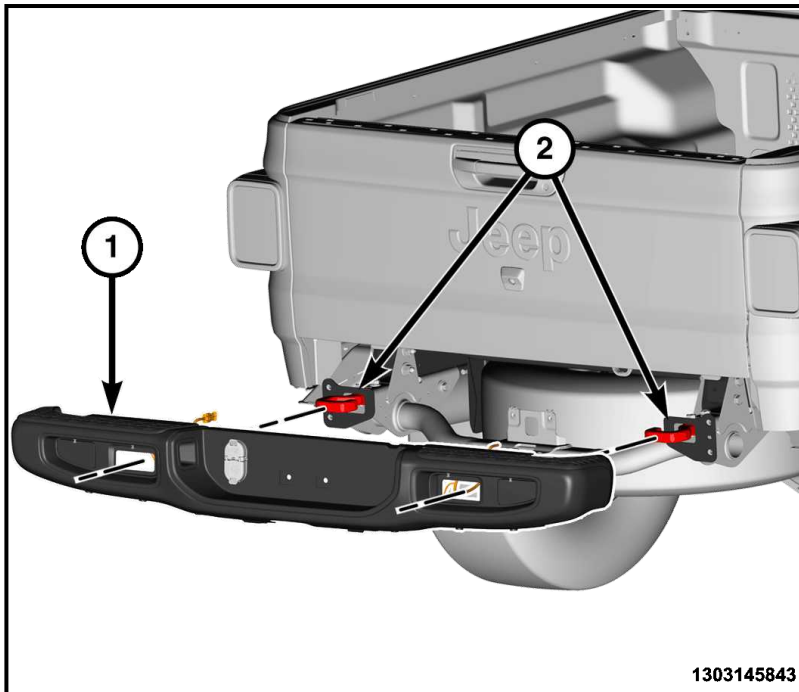
8. Disconnect the trailer wire harness connector (1), if equipped.



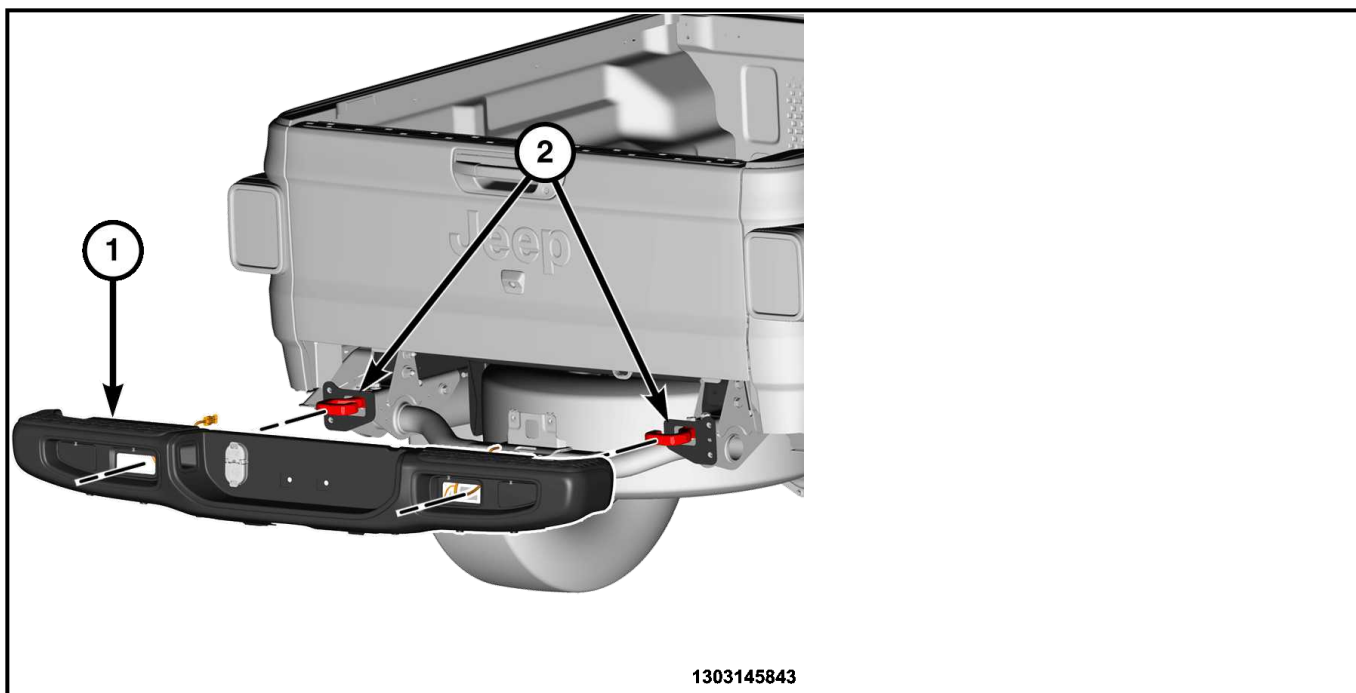
9. Remove the bumper to hitch nuts (1).



10. Remove the license plate, if equipped, and remove the center bolts (1).

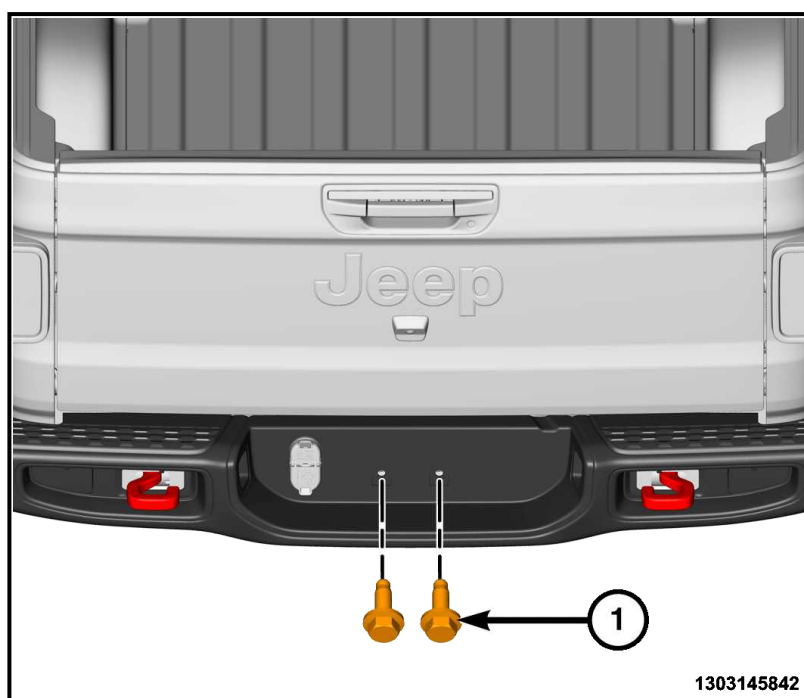


11. Remove the bumper (1) from the trailer hitch brackets (2).

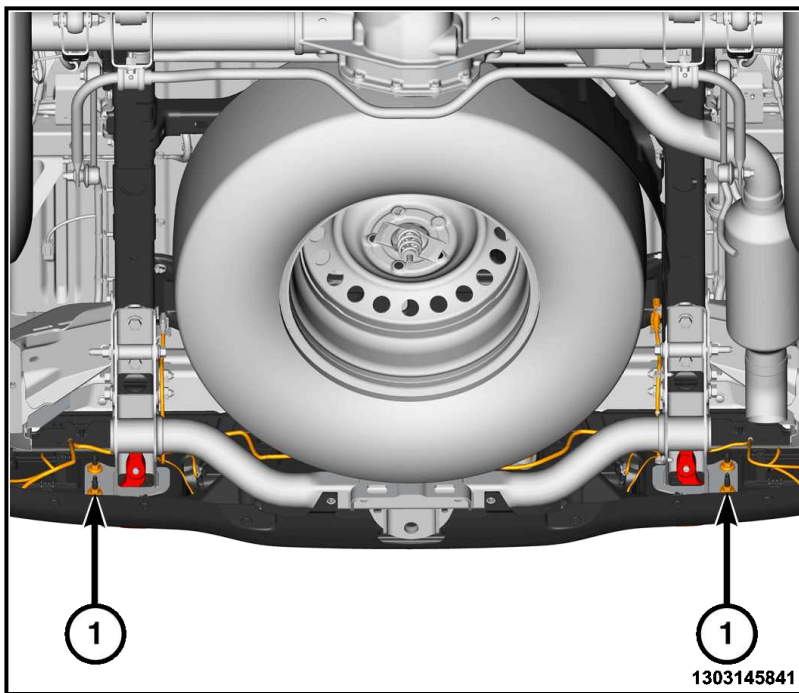


INSTALLATION

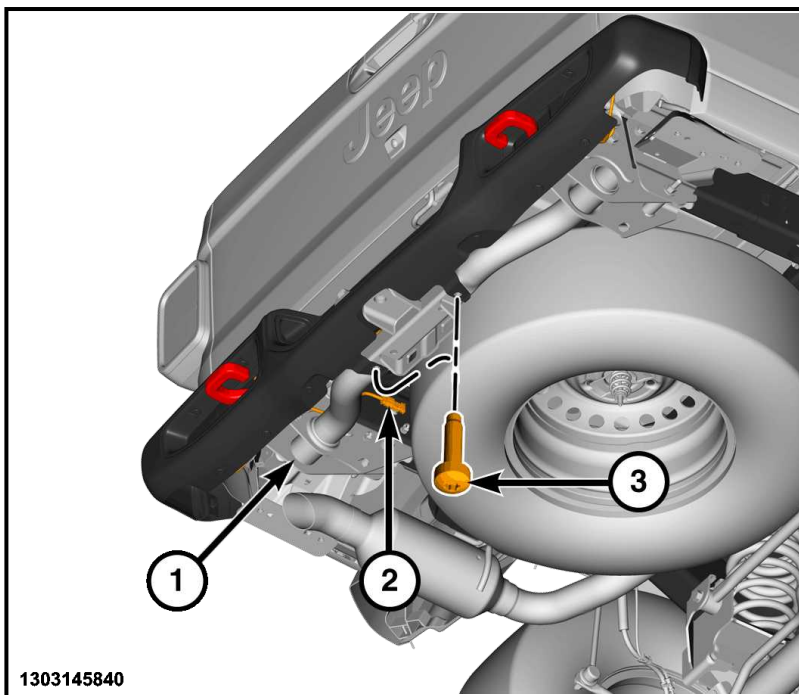
1. Position the bumper (1) onto the trailer hitch brackets (2).



2. Install the center bolts (1) and tighten to the proper Refer to [TORQUE SPECIFICATIONS](#) .



3. Install the hitch nuts (1) and tighten to the proper Refer to **TORQUE SPECIFICATIONS** .

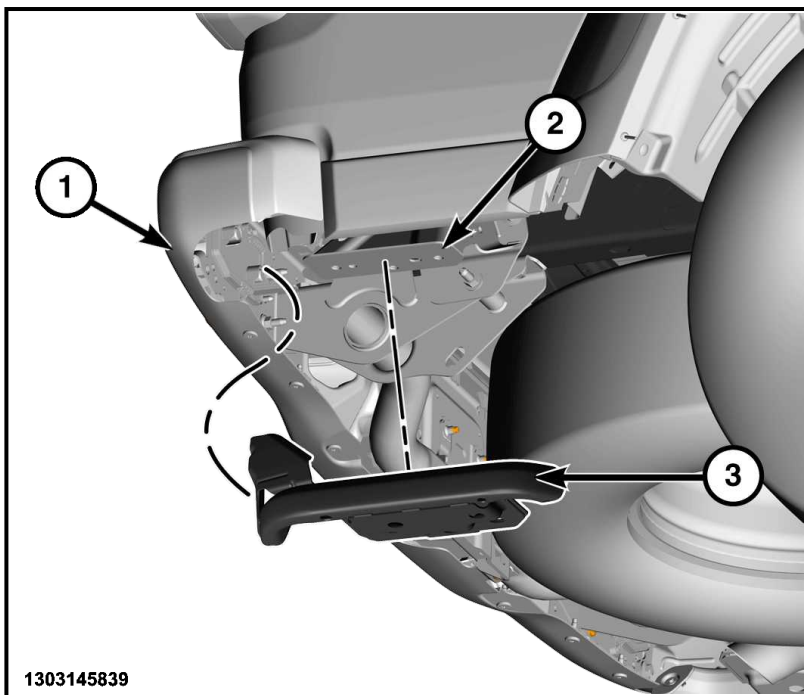


4. Install the bottom bolts (3) into the trailer hitch (1) and tighten to the proper Refer to **TORQUE SPECIFICATIONS** .

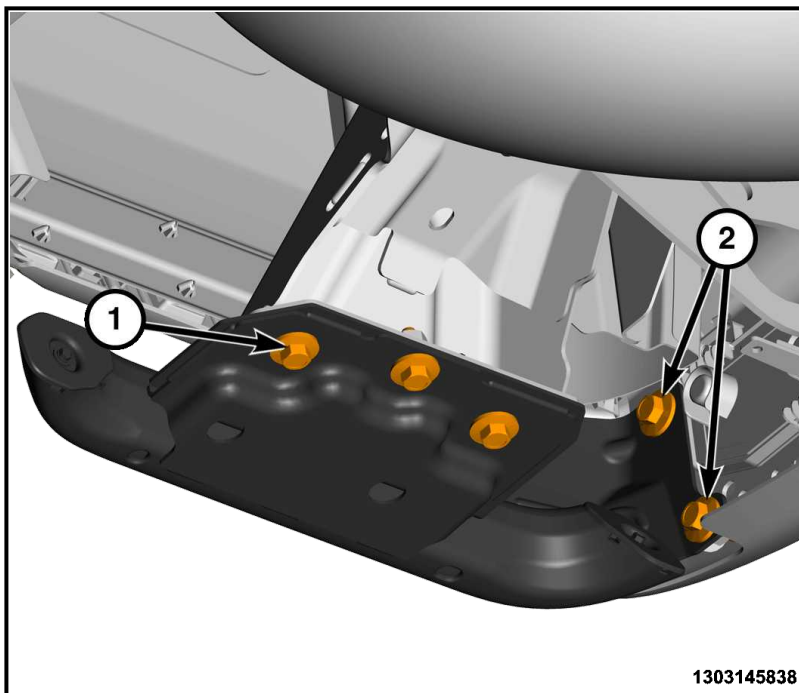
5. Connect the wire harness connectors (2).



6. Connect the trailer wire harness connector (1), if equipped.



7. Position the bumper guards (3) onto the bumper (1) and the brackets (2).

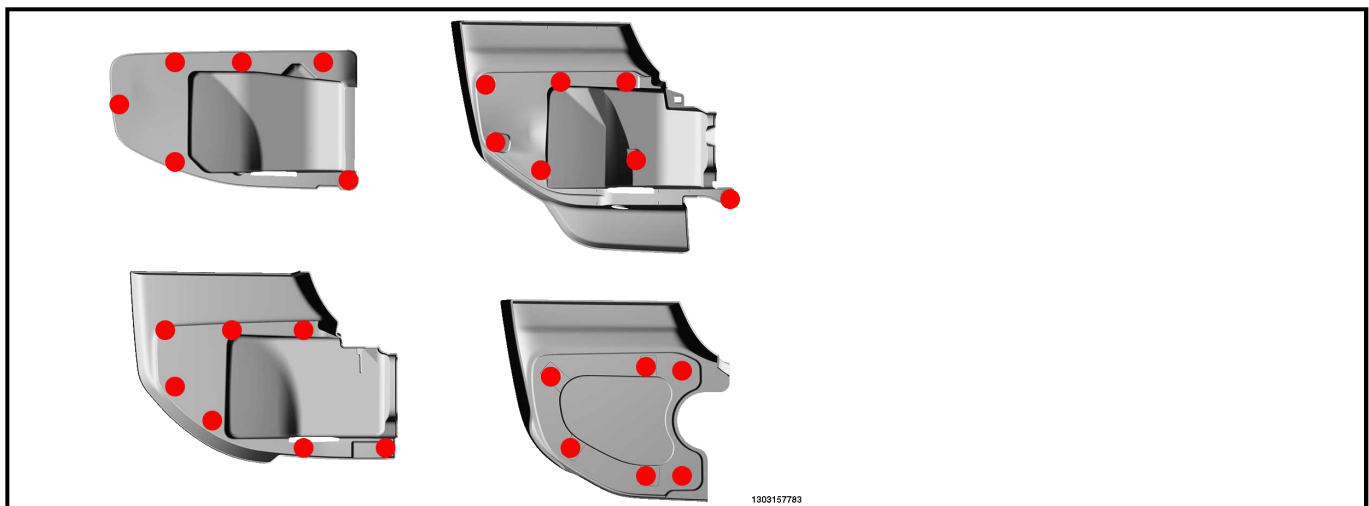


8. Install **NEW** bumper guard bracket bolts (1) and tighten to the proper Refer to **TORQUE SPECIFICATIONS** .
9. Install **NEW** bumper guard to bumper bolts (2) and tighten to the proper Refer to **TORQUE SPECIFICATIONS** .
10. Connect the negative battery cable(s). Refer to the appropriate service information .

COVER, CLOSEOUT

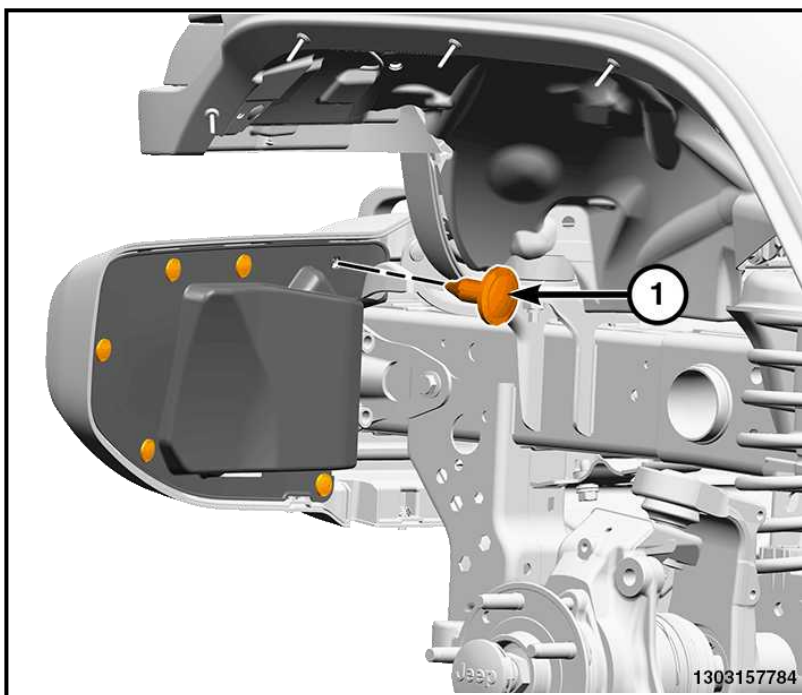
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

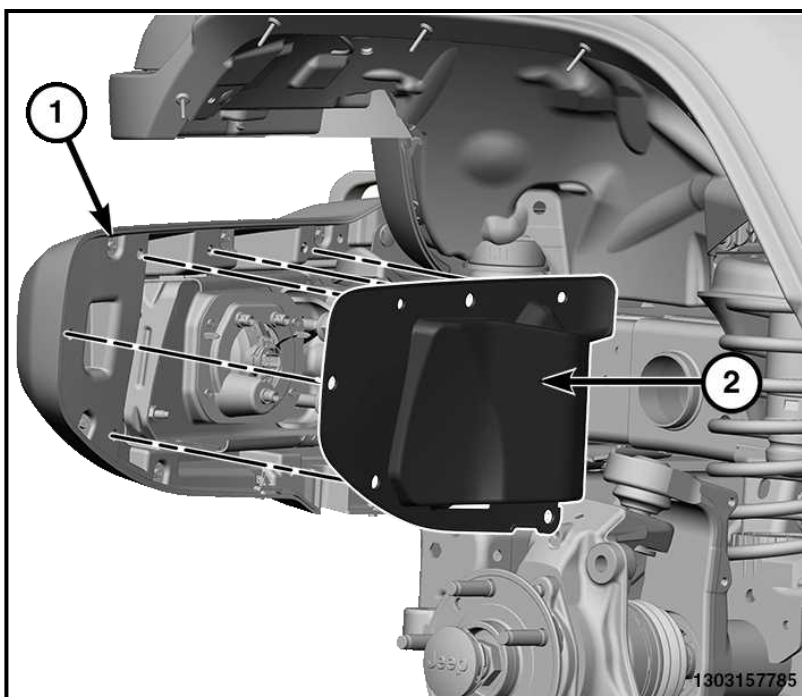


REMOVAL

1. Remove the front air dam if necessary, Refer to **AIR DAM, FRONT, REMOVAL AND INSTALLATION**.



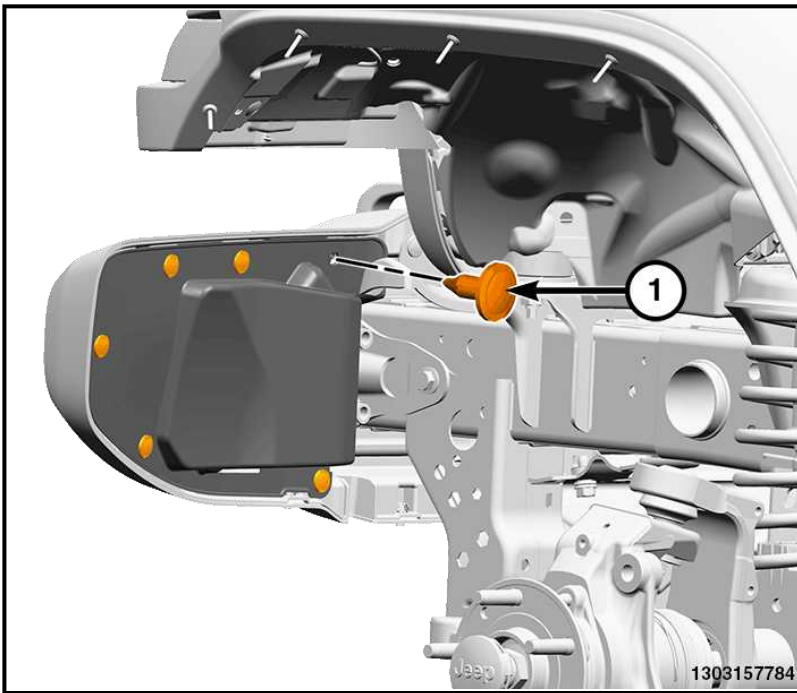
2. Remove the push pin fasteners (1). Refer to Figure 1 for applicable fastener location.



3. Remove the cover (2) from the bumper (1).

INSTALLATION

1. Install the cover (2) back onto the bumper (1).



2. Install the fasteners (1). Refer to Figure 1 for applicable fastener location.
3. Install the front air dam if necessary, Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION](#).

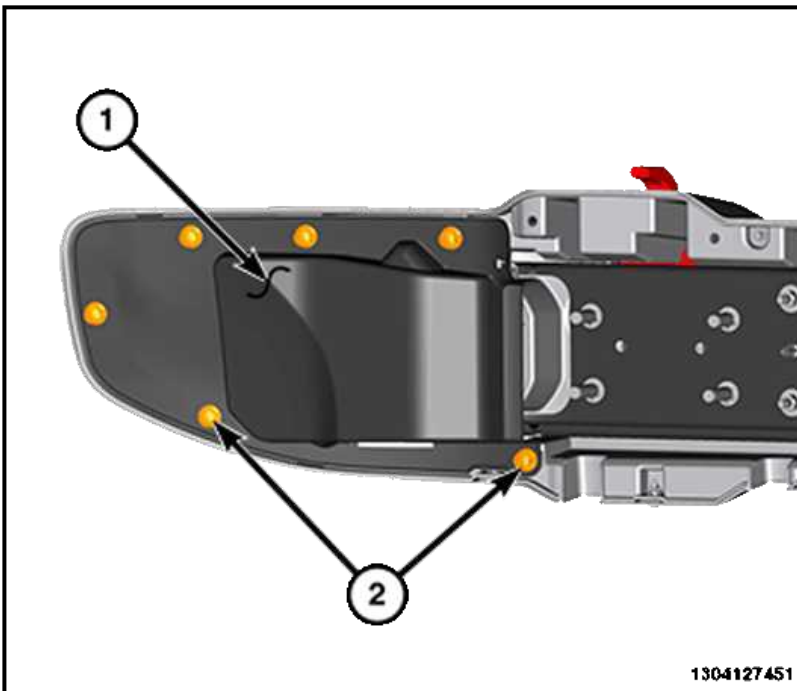
FASCIA, FRONT

REMOVAL AND INSTALLATION

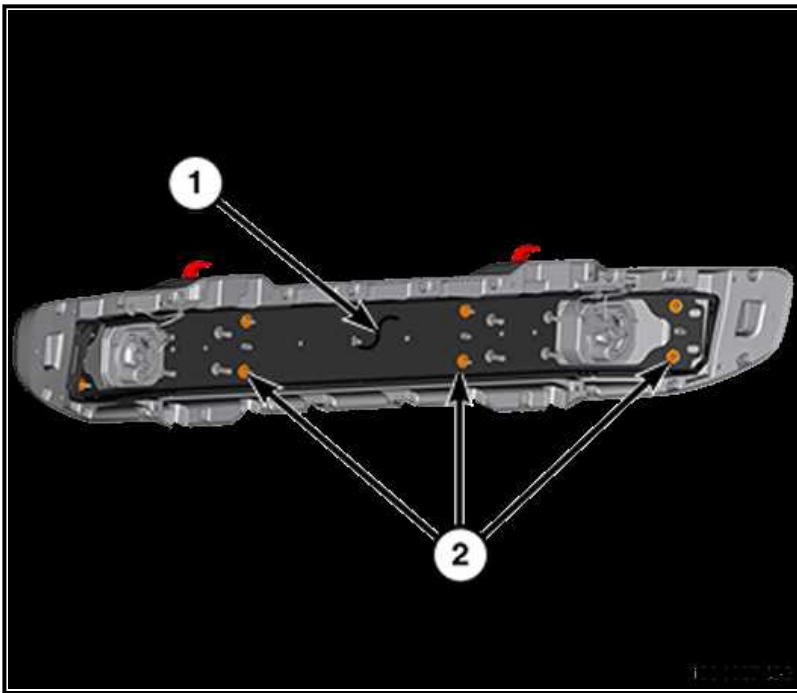
REMOVAL AND INSTALLATION

REMOVAL

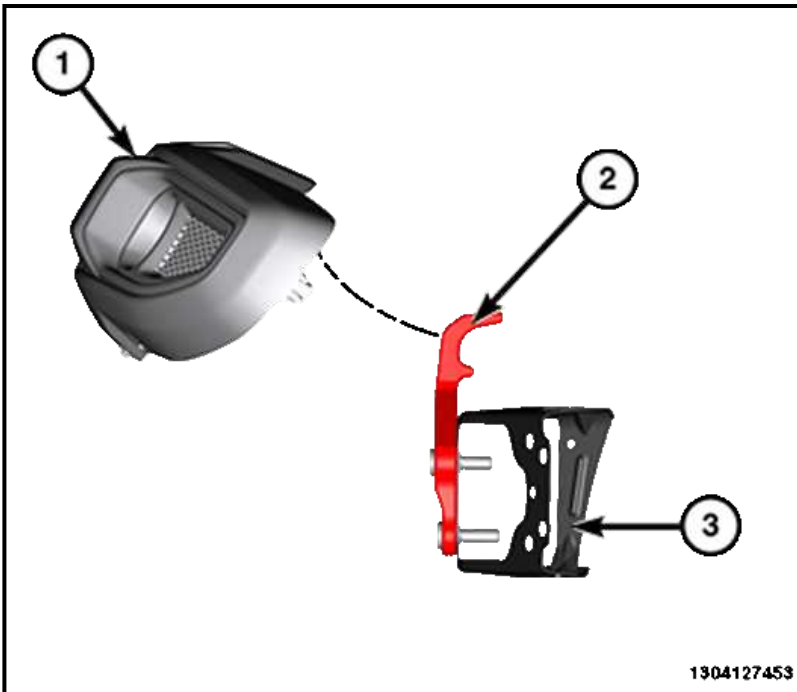
1. Remove the bumper assembly Refer to [BUMPER, FRONT, REMOVAL AND INSTALLATION](#).



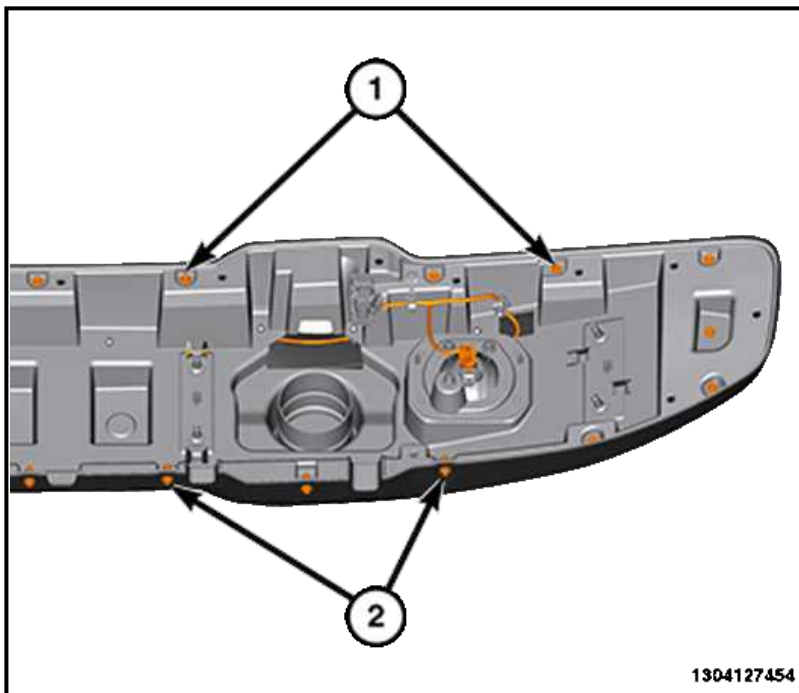
2. Remove the push pin fasteners (2) and remove the closeout panels (1).



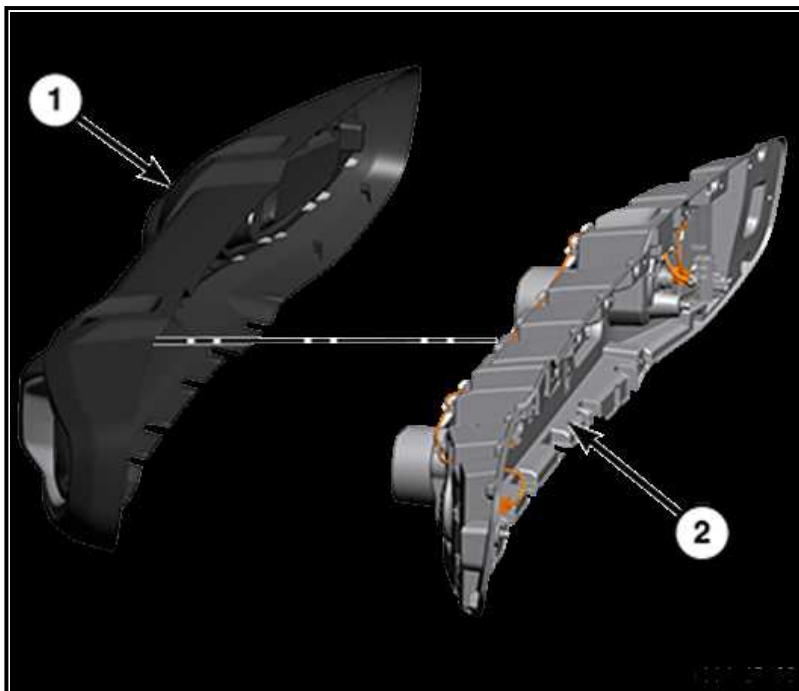
3. Remove the nuts (2) and remove the support bracket (1).



4. Lift the fascia and energy absorber assembly (1) off of the support bracket (3) and tow hook (2).



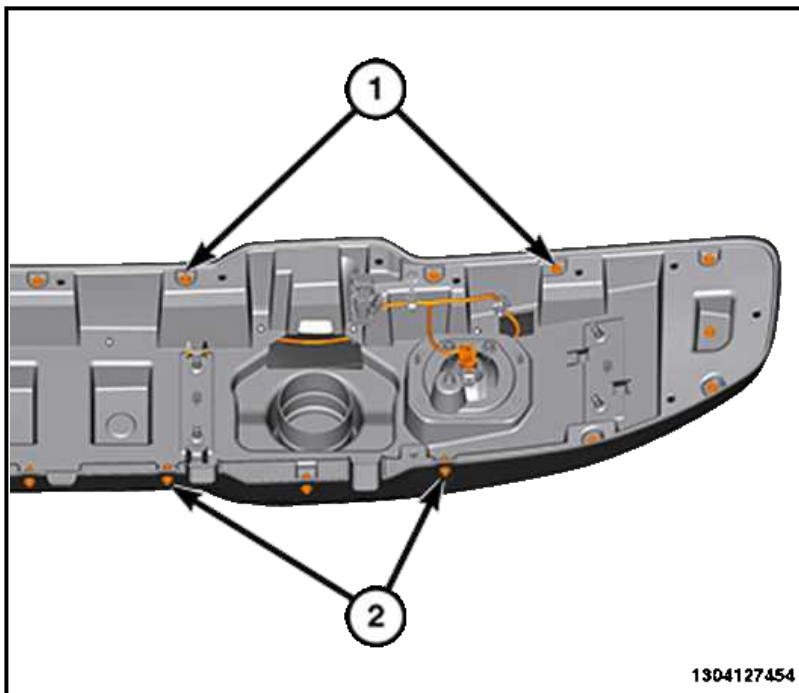
5. Remove the 16 inner screws (1).
6. Remove the eight lower screws (2).



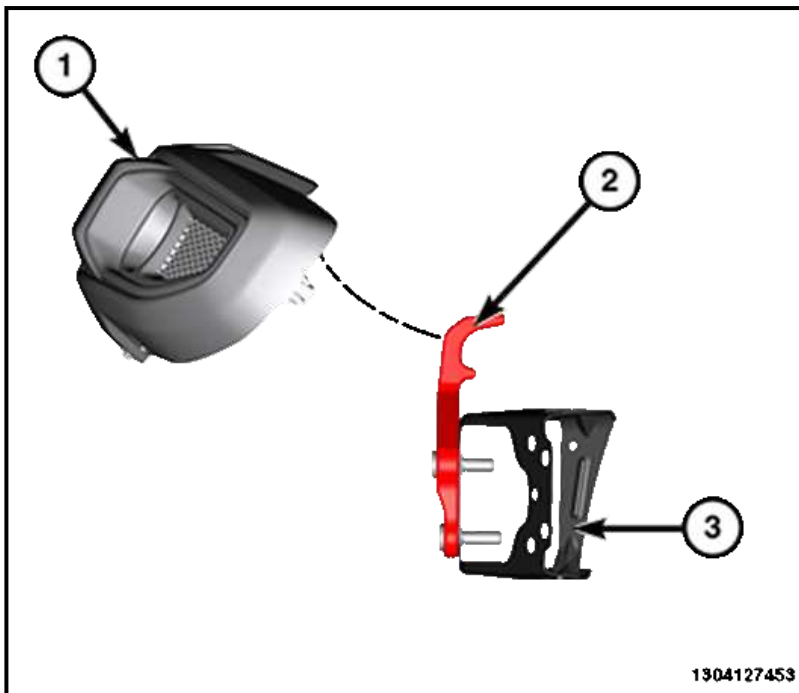
7. Separate the fascia (1) from the energy absorber assembly (2).

INSTALLATION

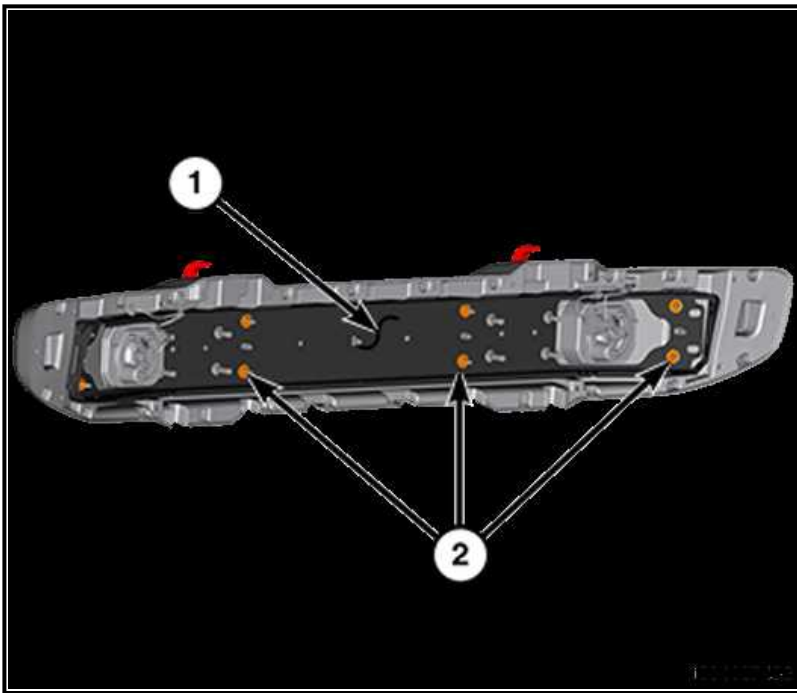
1. Install the fascia (1) onto the energy absorber assembly (2).



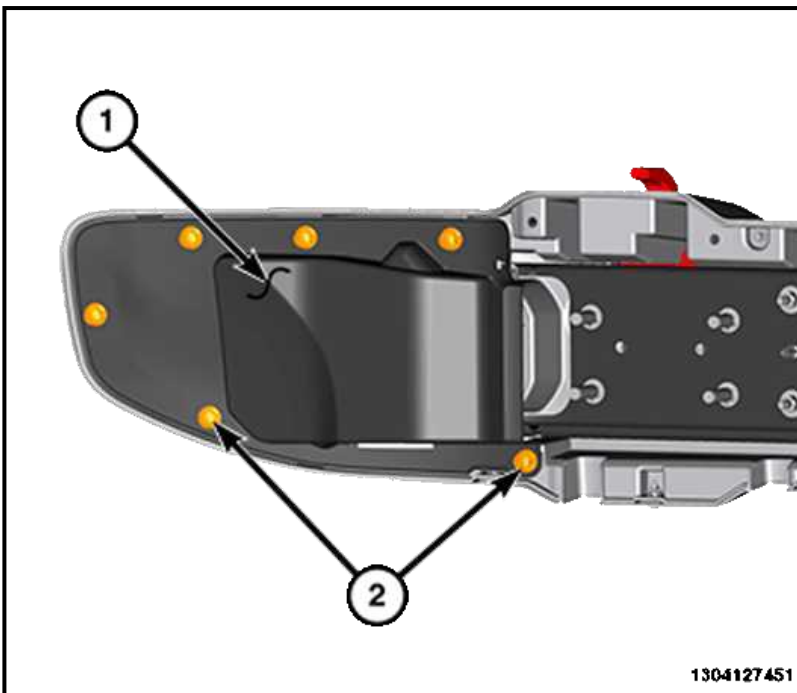
2. Install the eight lower screws (2) and tighten securely.
3. Install the 16 inner screws (1) and tighten securely.



4. Install the fascia and energy absorber assembly (1) down over the tow hooks (2) and seat onto the support bracket (3) fully.



5. Seat the support bracket (1) fully and install the nuts (2).
6. Tighten the support bracket nuts (2) to the proper Refer to [TORQUE SPECIFICATIONS](#) .



7. Install the closeout panels (1) and install the push pin fasteners (2).
8. Install the bumper assembly, Refer to [BUMPER, FRONT, REMOVAL AND INSTALLATION](#).

FRAME

WARNING

USE OF HEAT DURING REPAIR

Be certain to follow guidance and instructions as found in the Use of Heat While Repairing Damaged Structural And Non-Structural Components as found in Service Bulletins/31-Collision Bulletins and Collision Information/Position Statements.

WARNING: Failure to follow these instructions may result in possible serious or fatal injury.

WARNINGS

WARNING:

Use an Occupational Safety and Health Administration (OSHA) approved breathing filter, when spraying paint or solvents in a confined area. Failure to follow these instructions may result in possible serious or fatal injury.

- Avoid prolonged skin contact with petroleum or alcohol based cleaning solvents.
- Do not stand under a hoisted vehicle that is not properly supported on safety stands. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING:

On vehicles equipped with the high voltage system, disconnecting the 12-volt battery negative cable alone will not power down the 12-volt system. You must perform the 12-volt Power Down procedure before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

CAUTION:

When holes are drilled or punched in an inner body panel, verify the depth of space to the outer body panel, electrical wiring or other components. Damage to the vehicle can result.

- Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.
- Always have a fire extinguisher ready for use when welding.
- Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is off. Damage to electrical system can result.
- Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.
- Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.
- Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.

RESTRAINT WARNINGS

WARNING:

To avoid serious or fatal injury during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or ineffective buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or ineffective seat belt and child restraint components with the correct, new and unused replacement parts listed in the MoparB® Parts Catalog. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING:

To avoid serious or fatal injury on vehicles equipped with the Supplemental Restraint System (SRS), never attempt to repair the electrically conductive circuits or wiring components related to the SRS for which there is no

MoparB® wiring repair kit. It is important to use **ONLY** the recommended splicing kit and procedure. For applicable and available MoparB® wiring repair kits, please visit the MoparB® Connection Repair Kit Web Site. Inappropriate repairs can compromise the conductivity and current carrying capacity of those critical electrical circuits, which may cause SRS components not to deploy when required, or to deploy when not required. Only minor cuts or abrasions of wire and terminal insulation where the conductive material has not been damaged, or connector insulators where the integrity of the latching and locking mechanisms have not been compromised may be repaired using appropriate methods.

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, Occupant Classification System (OCS), seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to follow these instructions may result in accidental airbag deployment.

WARNING: To avoid potential physical injury or damage to sensitive electronic circuits and systems, always disconnect and isolate the battery negative (ground) cable and the positive cable, then ground the positive cable to discharge the Occupant Restraint Controller (ORC) capacitor before performing any welding operations on the vehicle. Failure to take the proper precautions could result in accidental airbag deployment, possible damage to the Supplemental Restraint System (SRS) circuits and components, and possible damage to other electronic circuits and components. Whenever a welding process is being performed within 12 inches (30 centimeters) of an electronic module or wiring harness, then that module or harness should be relocated out of the way, or disconnected. Always protect against component or vehicle damage from weld spatter by using weld blankets and screens.

WARNING: To avoid serious or fatal injury, do not attempt to dismantle an airbag unit or tamper with its inflator. Do not puncture, incinerate or bring into contact with electricity. Do not store at temperatures exceeding 93B° C (200B° F). An airbag inflator unit may contain sodium azide and potassium nitrate. These materials are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases (sodium hydroxide is formed in the presence of moisture) or combustible compounds. An airbag inflator unit may also contain a gas canister pressurized to over 17.24 kPa (2500 psi). Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: To avoid serious or fatal injury when handling a seat belt tensioner retractor. Exercise proper care to keep fingers out from under the retractor cover and away from the seat belt webbing where it exits from the retractor cover. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: To avoid serious or fatal injury, replace all Supplemental Restraint System (SRS) components only with parts specified in the MoparB® Parts Catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection.

WARNING: To avoid serious or fatal injury, the fasteners, screws, and bolts originally used for the Supplemental Restraint System (SRS) components must never be

replaced with any substitutes. These fasteners have special coatings and are specifically designed for the SRS. Anytime a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the MoparB® Parts Catalog.

WARNING:

To avoid serious or fatal injury when a steering column has an airbag unit attached, never place the column on the floor or any other surface with the steering wheel or airbag unit face down. Failure to follow these instructions may result in possible serious or fatal injury.

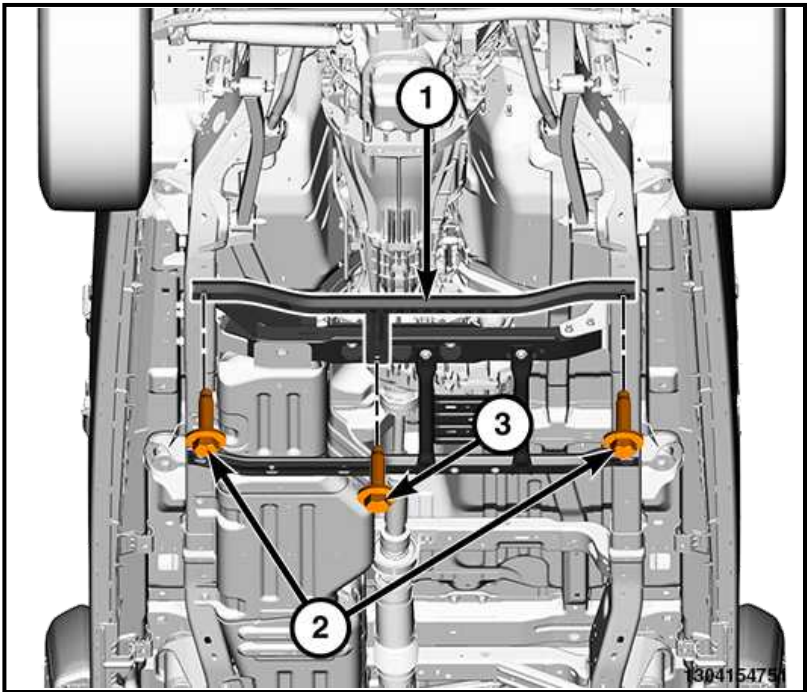
CROSSMEMBER, FRONT REINFORCEMENT

REMOVAL AND INSTALLATION

FRONT CROSSMEMBER

REMOVAL

1. Raise and support the vehicle Refer to [HOISTING, STANDARD PROCEDURE](#) .



1 - Crossmember
2 - Front Reinforcement Crossmember Frame Bolt
3 - Front Reinforcement Crossmember Bolt

2. Remove the front reinforcement crossmember bolt.
3. Remove the front reinforcement crossmember frame bolts and remove the crossmember.

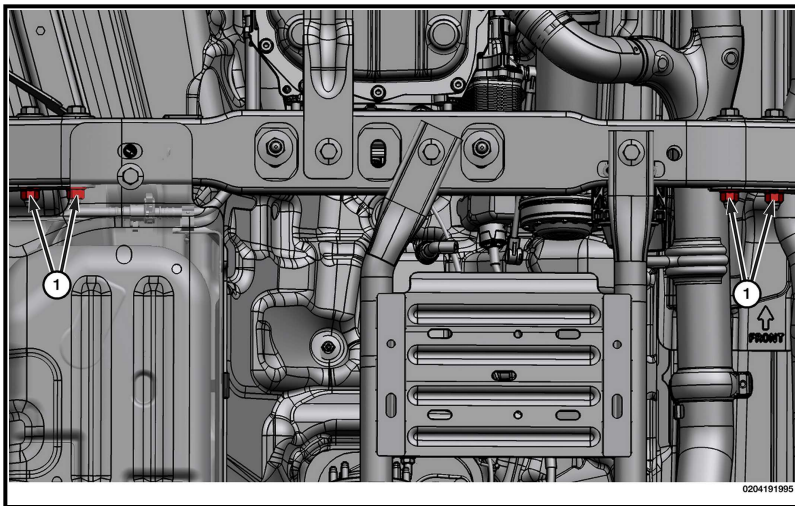
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

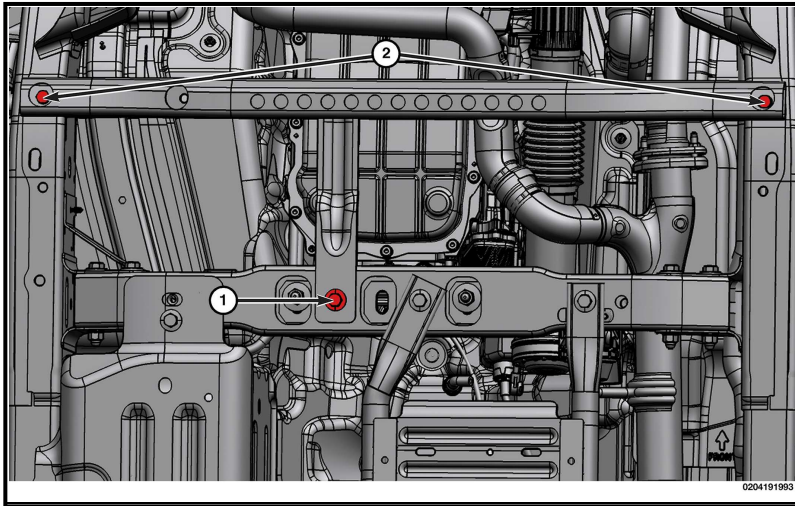
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

CROSSMEMBER



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Transmission Crossmember Frame Nuts	70 N.m (52 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Reinforcement Crossmember Bolt	75 N.m (55 Ft. Lbs.)	-
2	Front Reinforcement Crossmember Frame Bolt	75 N.m (55 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.

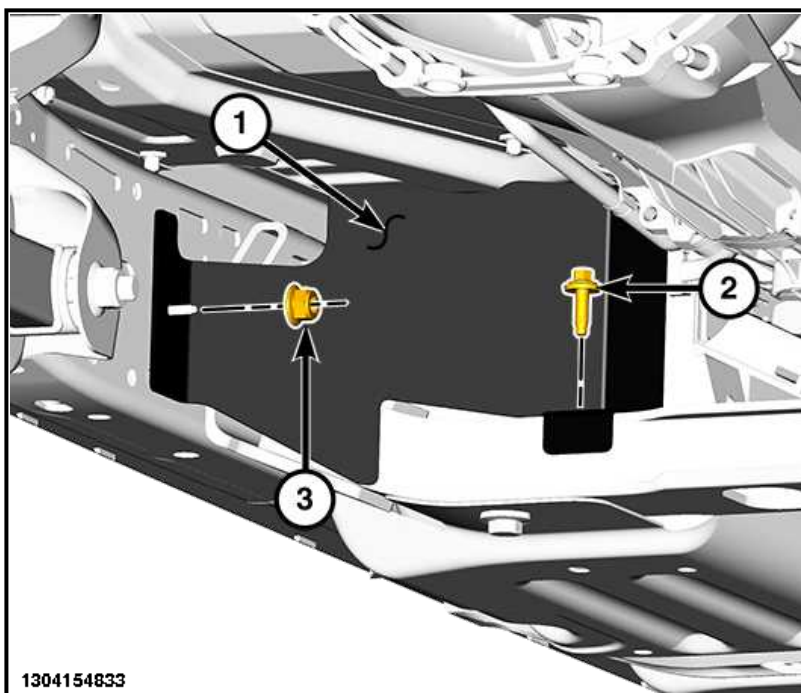
CROSSMEMBER, TRANSMISSION

REMOVAL AND INSTALLATION

TRANSMISSION CROSSMEMBER

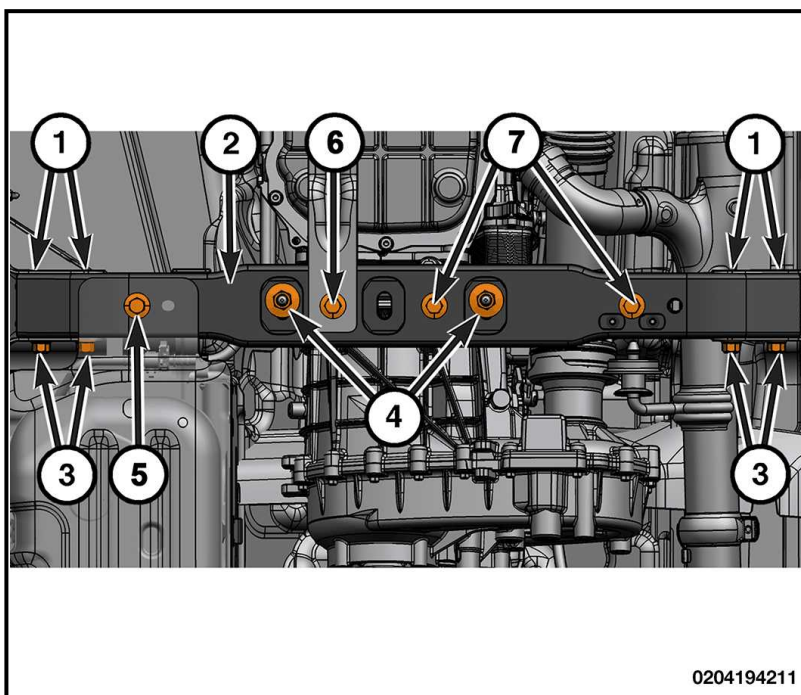
REMOVAL

1. Remove the transfer case skid plate, Refer to **PLATE, SKID, TRANSFER CASE, REMOVAL AND INSTALLATION**.
2. Remove the front reinforcement crossmember, Refer to **CROSSMEMBER, FRONT REINFORCEMENT, REMOVAL AND INSTALLATION** .



1 - Deflector Shield
2 - Deflector Shield Bolt
3 - Deflector Shield Nut

3. Remove the nut, the bolt and remove the deflector shield.



1 - Transmission Crossmember Frame Bolts	5 - Fuel Tank Skid Plate Bolt
2 - Transmission Crossmember	6 - Front Reinforcement Crossmember Bolt
3 - Transmission Crossmember Frame Nuts	7 - Transfer Case Skid Plate Bolts
4 - Transmission Mount Nuts	B

4. Support the transmission with a suitable lifting device.
5. Remove the transmission crossmember frame nuts and bolts.
6. Remove the fuel tank skid plate bolt.
7. Remove the front reinforcement crossmember bolt.
8. Remove the transfer case skid plate bolts, if equipped.

- 9. Remove the transmission mount nuts.
- 10. Remove the crossmember.

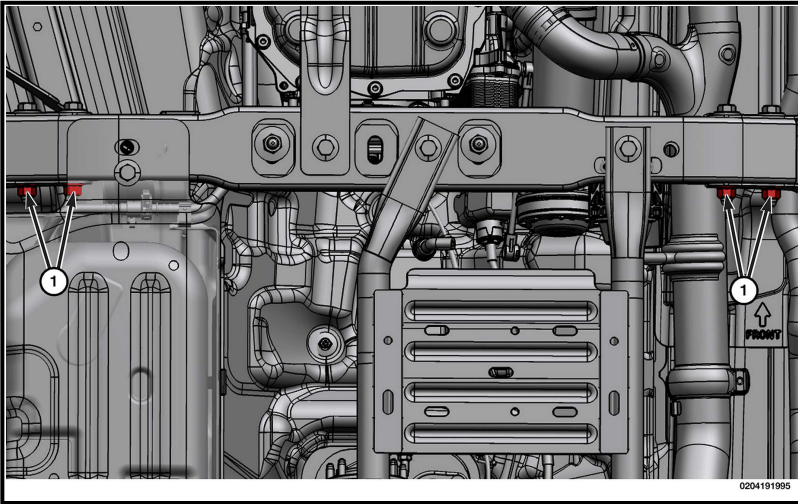
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

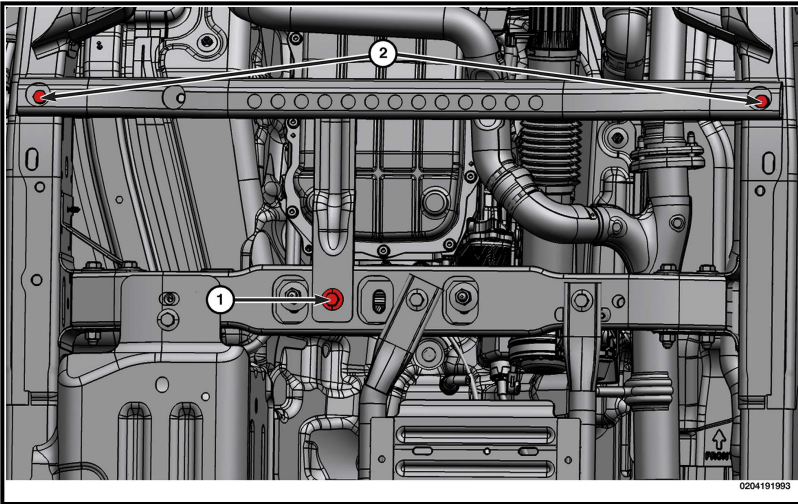
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

CROSSMEMBER



CalloUT	DEscriPtion	SpecifiCation	CoMment
1	Transmission Crossmember Frame Nuts	70 N.m (52 Ft. Lbs.)	-



CalloUT	DEscriPtion	SpecifiCation	CoMment
1	Front Reinforcement Crossmember Bolt	75 N.m (55 Ft. Lbs.)	-
2	Front Reinforcement Crossmember Frame Bolt	75 N.m (55 Ft. Lbs.)	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.

HITCH, TRAILER

REMOVAL AND INSTALLATION

TRAILER HITCH

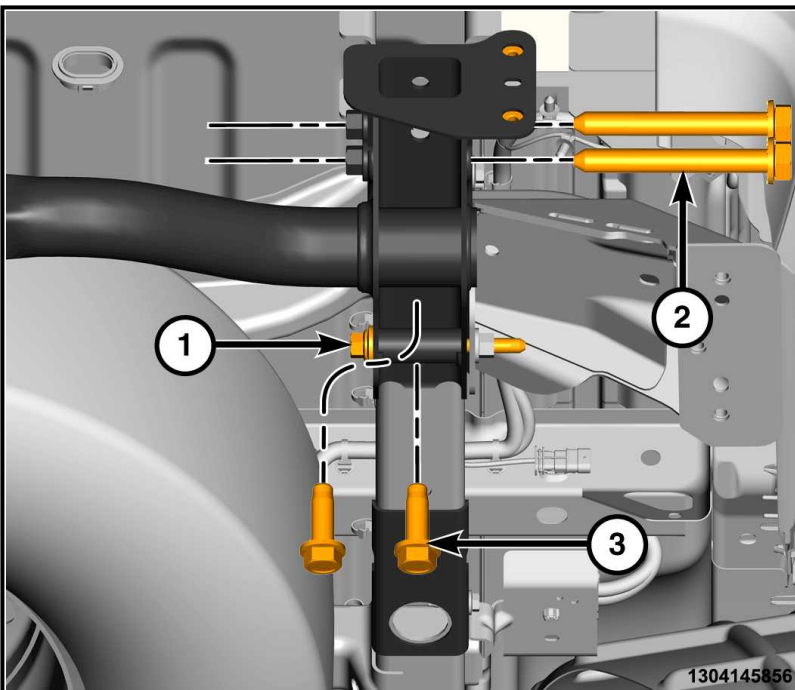
REMOVAL

1. Raise and support the vehicle Refer to [HOISTING, STANDARD PROCEDURE](#) .
2. Remove the rear bumper Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#).
3. Remove the rear tow hooks Refer to [HOOK\(S\), TOW, REMOVAL AND INSTALLATION](#).



1 - Wire Harness Support Clips

4. Release the wire harness support clips from the hitch.

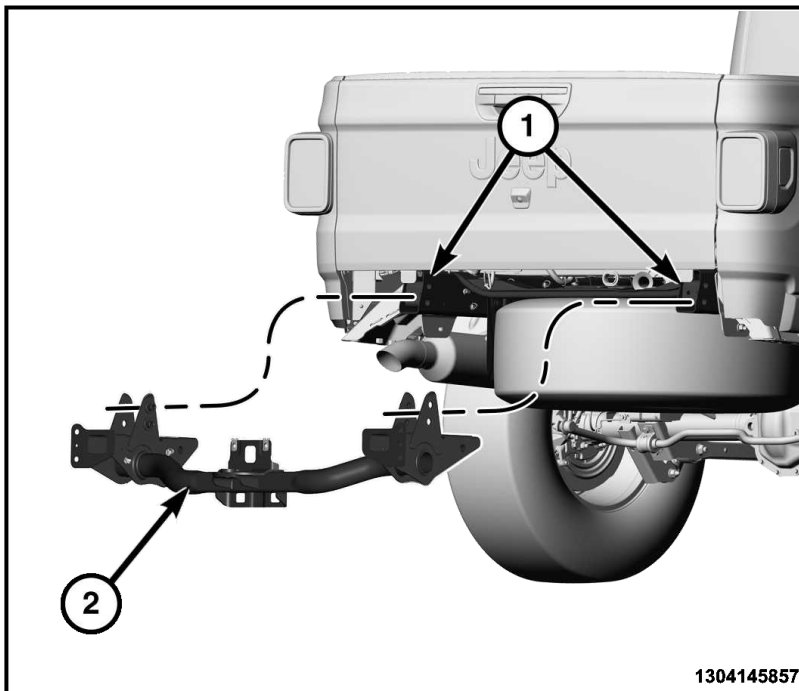


1 - Bracket Bolts

2 - Rear Bolts

3 - Front Bolts

5. Remove the bracket bolts.
6. Remove the front bolts.
7. Remove the rear bolts.



1 - Frame Rails
2 - Hitch Assembly

8. Slide the hitch assembly off the rear frame rails and remove.

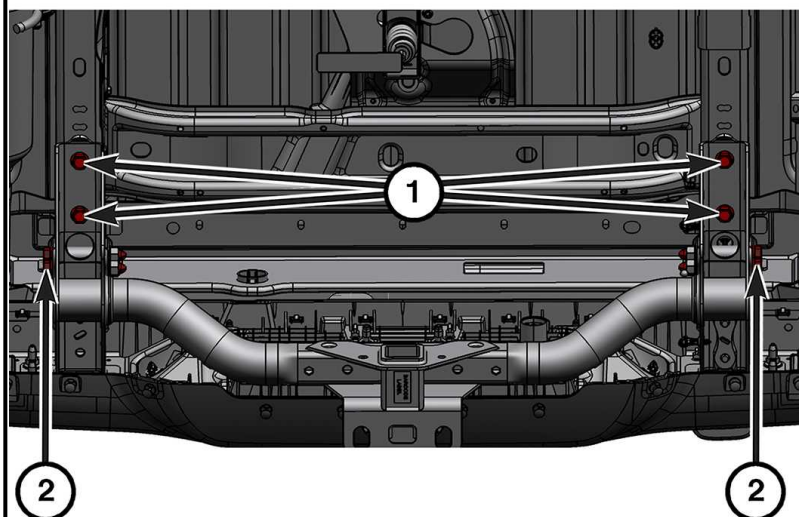
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

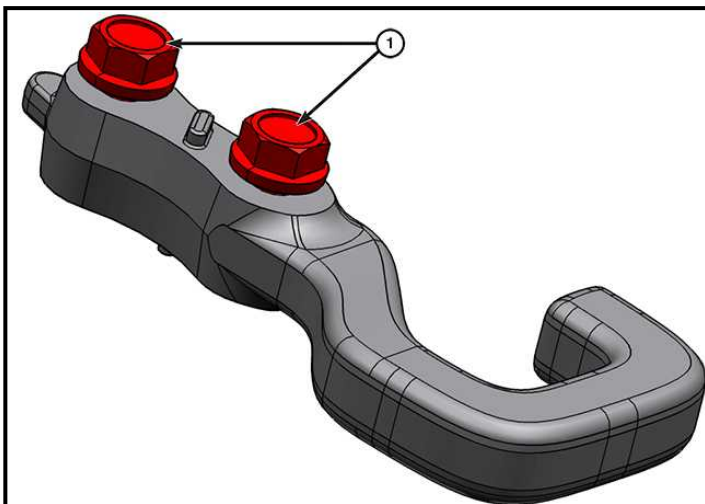
TORQUE SPECIFICATIONS

TRAILER HITCH AND TOW HOOK



0204194206

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Trailer Hitch Frame Bolts	165 N.m (122 Ft. Lbs.)	-
2	Trailer Hitch Bolts	170 N.m (125 Ft. Lbs.)	-



0204192123

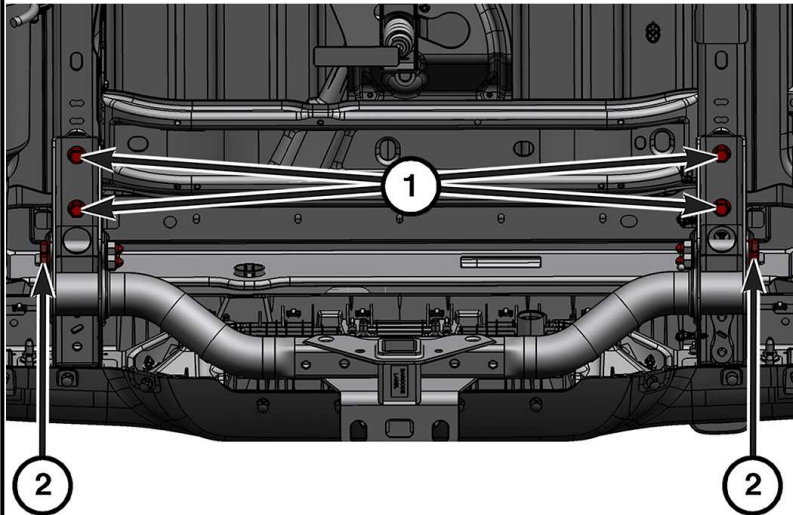
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Tow Hook Bolts	48 N.m (35 Ft. Lbs.)	-
2	Front Tow Hook Bracket Nut	48 N.m (35 Ft. Lbs.)	-
3	Front Tow Hook Nut	25 N.m (18 Ft. Lbs.)	-

HOOK(S), TOW

REMOVAL AND INSTALLATION

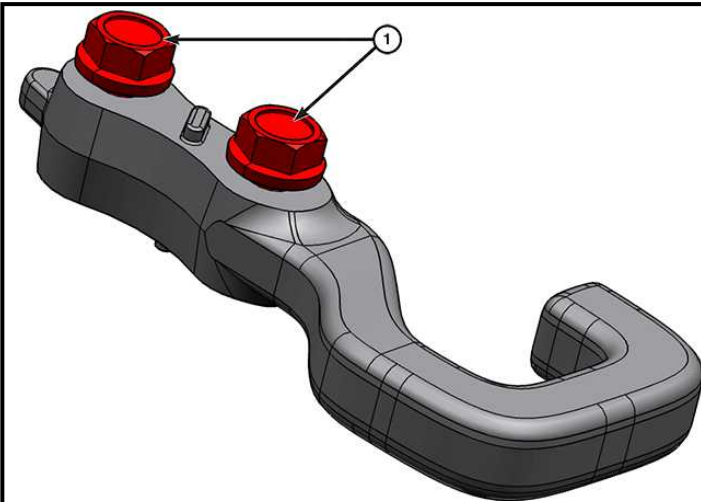
FRONT TOW HOOKS - PLASTIC BUMPER

TRAILER HITCH AND TOW HOOK



0204194206

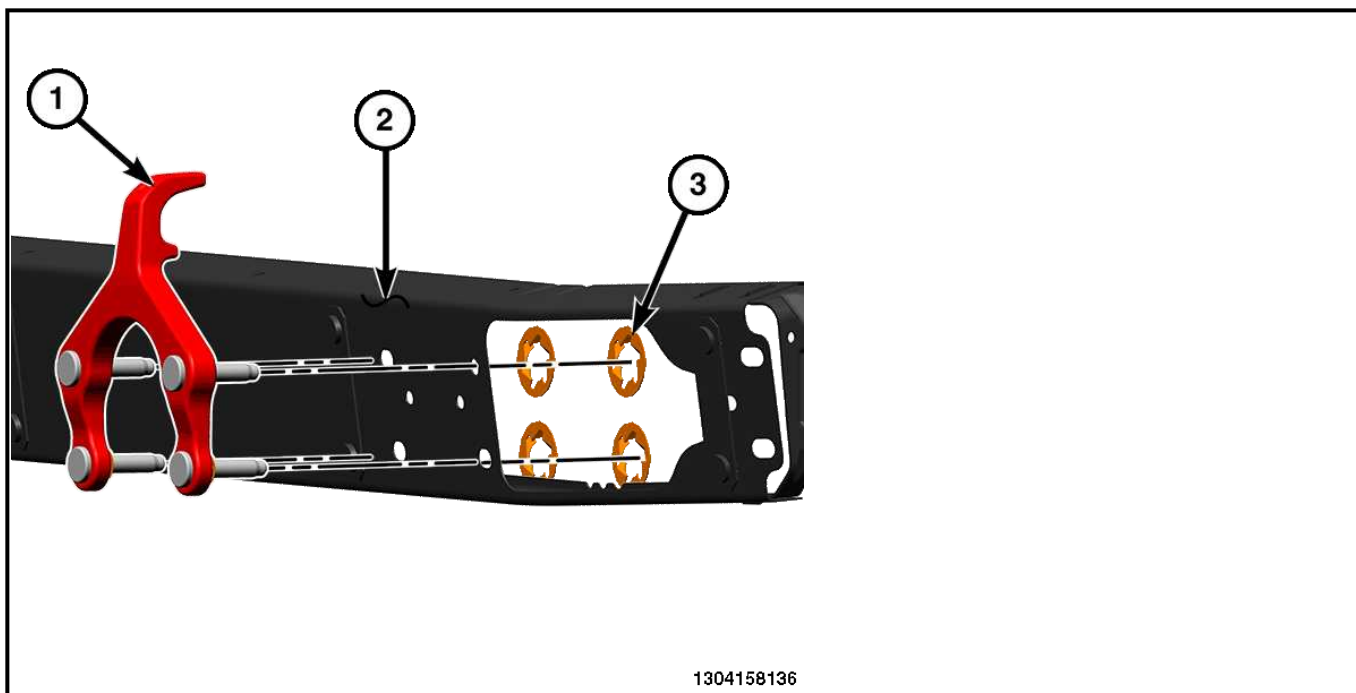
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Trailer Hitch Frame Bolts	165 N.m (122 Ft. Lbs.)	-
2	Trailer Hitch Bolts	170 N.m (125 Ft. Lbs.)	-



0204192123

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Tow Hook Bolts	48 N.m (35 Ft. Lbs.)	-
2	Front Tow Hook Bracket Nut	48 N.m (35 Ft. Lbs.)	-
3	Front Tow Hook Nut	25 N.m (18 Ft. Lbs.)	-

WITH PLASTIC BUMPER



1 - Tow Hook
2 - Support Bracket
3 - Clips

REMOVAL

1. Remove the front fascia, Refer to [FASCIA, FRONT, REMOVAL AND INSTALLATION](#).
2. Remove the clips and separate the tow hook from the support bracket.

INSTALLATION

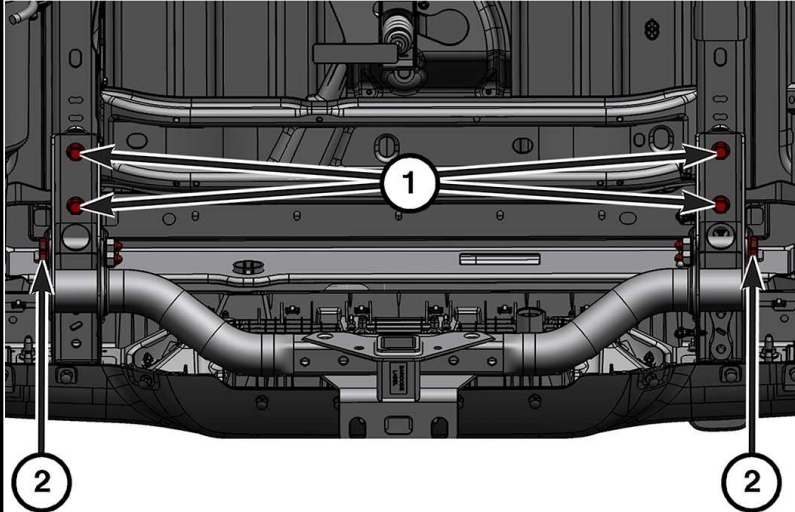
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

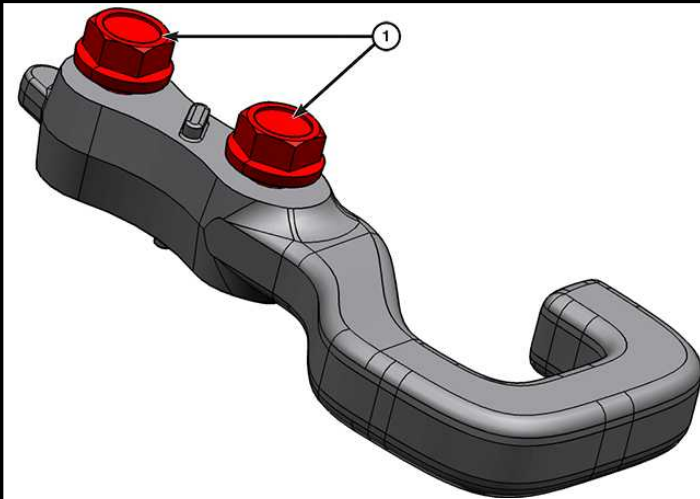
FRONT TOW HOOKS - STEEL BUMPER

TRAILER HITCH AND TOW HOOK



0204194206

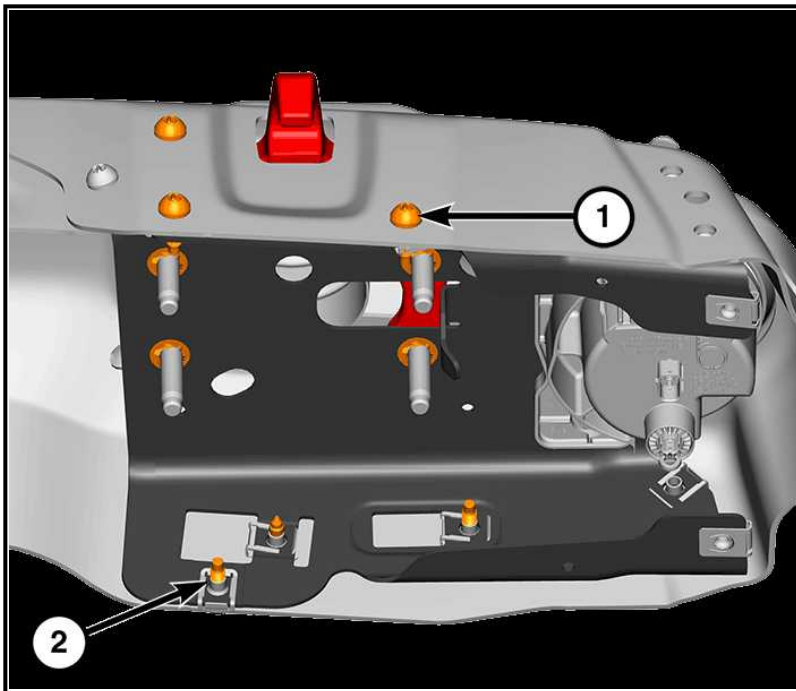
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Trailer Hitch Frame Bolts	165 N.m (122 Ft. Lbs.)	-
2	Trailer Hitch Bolts	170 N.m (125 Ft. Lbs.)	-



0204192123

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Tow Hook Bolts	48 N.m (35 Ft. Lbs.)	-
2	Front Tow Hook Bracket Nut	48 N.m (35 Ft. Lbs.)	-
3	Front Tow Hook Nut	25 N.m (18 Ft. Lbs.)	-

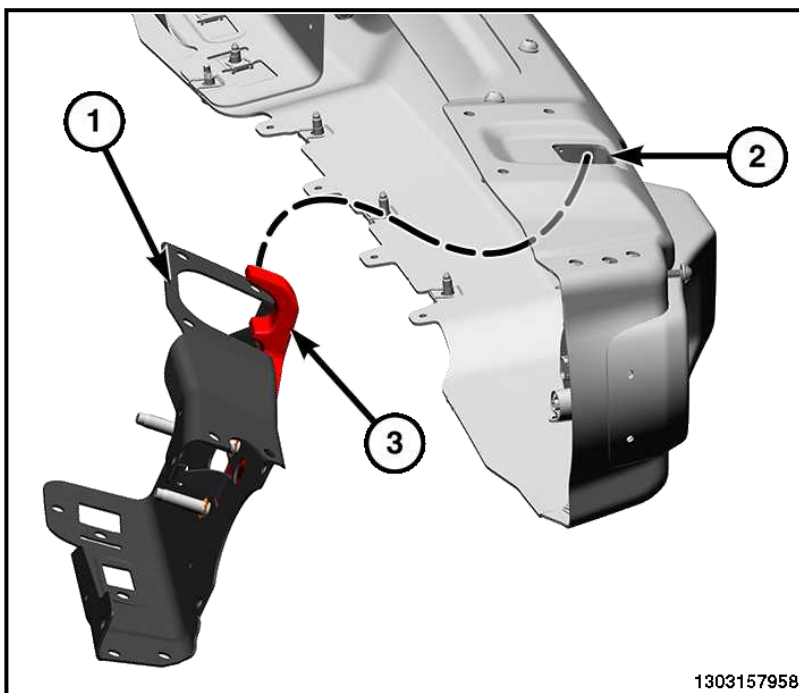
WITH STEEL BUMPER



1 - Upper Fasteners

2 - Lower Fasteners

1. Remove the front bumper, Refer to **BUMPER, FRONT, REMOVAL AND INSTALLATION**.
2. Remove the upper fasteners.
3. Remove the lower fasteners.



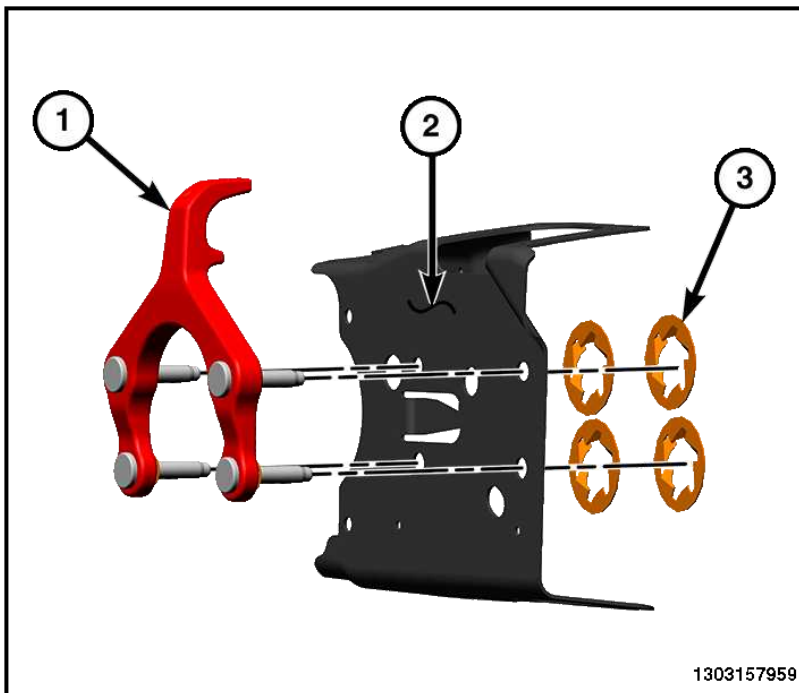
1303157958

1 - Support Bracket Assembly

2 - Bumper Assembly

3 - Tow Hook

4. Separate the support bracket assembly from the bumper assembly.



1303157959

- | |
|---------------------|
| 1 - Tow Hook |
| 2 - Support Bracket |
| 3 - Clips |

5. Remove the clips and separate the tow hook from the support bracket.

INSTALLATION

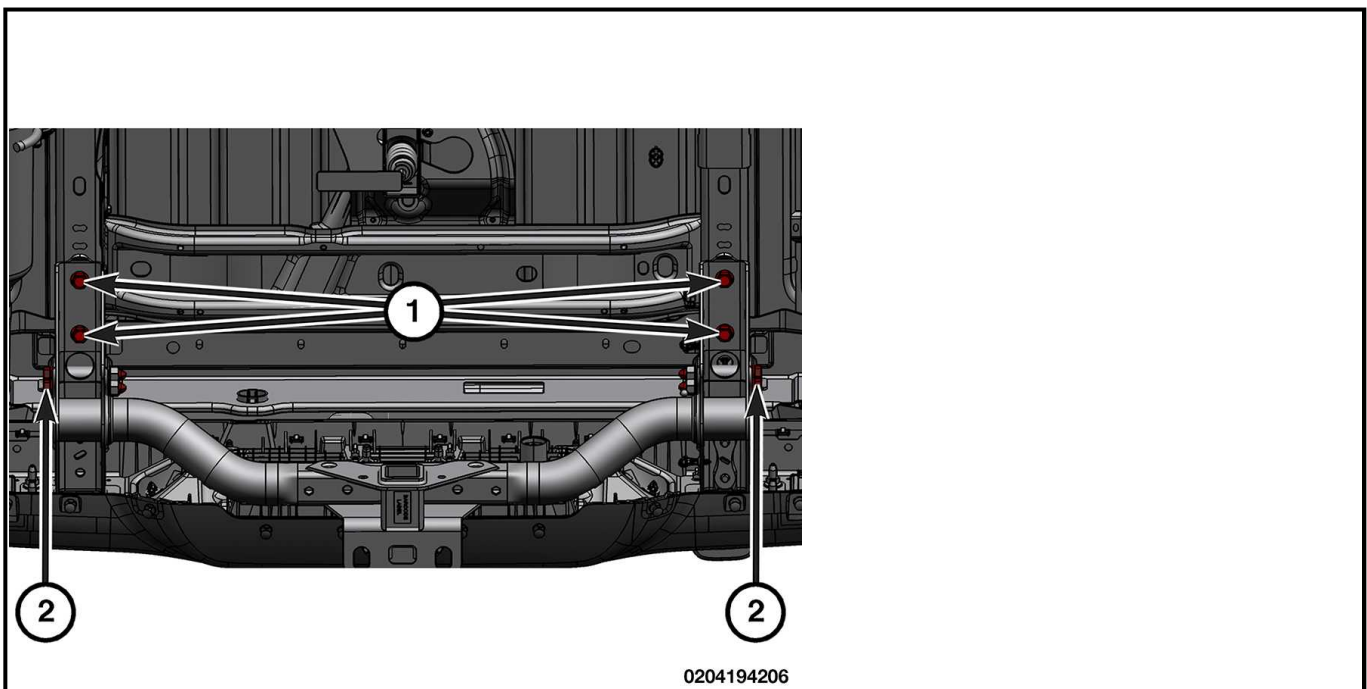
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

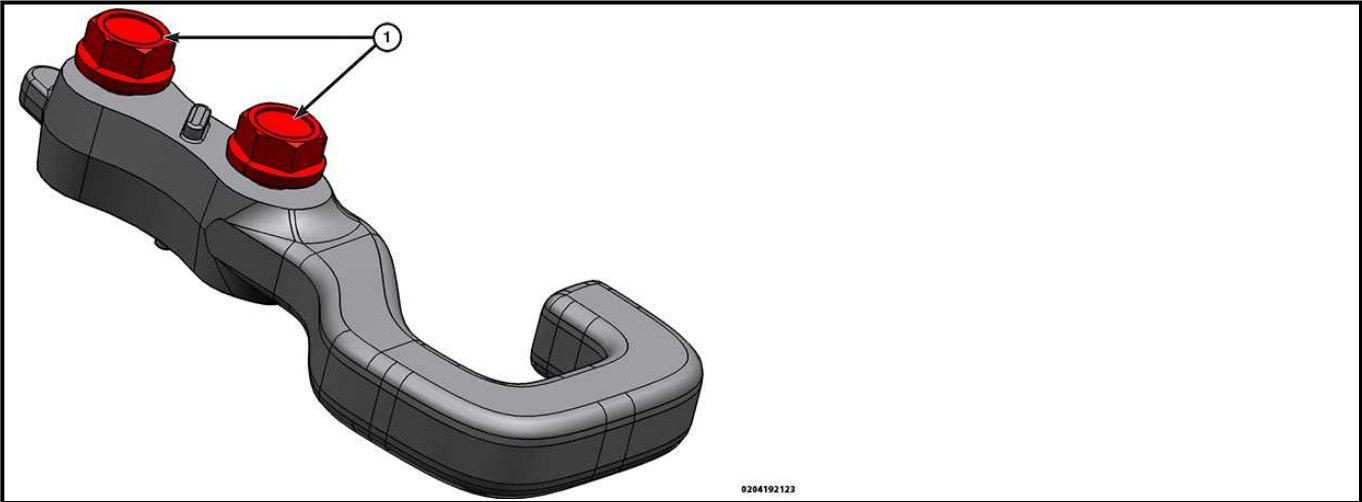
REAR TOW HOOKS

TRAILER HITCH AND TOW HOOK



0204194206

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Trailer Hitch Frame Bolts	165 N.m (122 Ft. Lbs.)	-
2	Trailer Hitch Bolts	170 N.m (125 Ft. Lbs.)	-

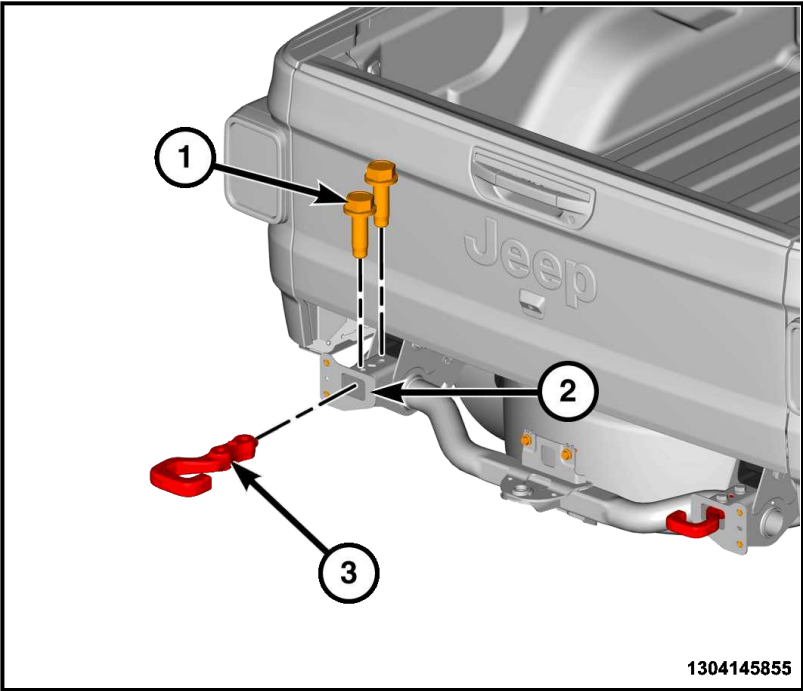


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Tow Hook Bolts	48 N.m (35 Ft. Lbs.)	-
2	Front Tow Hook Bracket Nut	48 N.m (35 Ft. Lbs.)	-
3	Front Tow Hook Nut	25 N.m (18 Ft. Lbs.)	-

REMOVAL AND INSTALLATION

REMOVAL

1. Remove the rear bumper, Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#).



1 - Bolts
2 - Frame
3 - Tow Hook

2. Remove the bolts (1) and remove the tow hook (3).

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

UNDER BODY PROTECTION

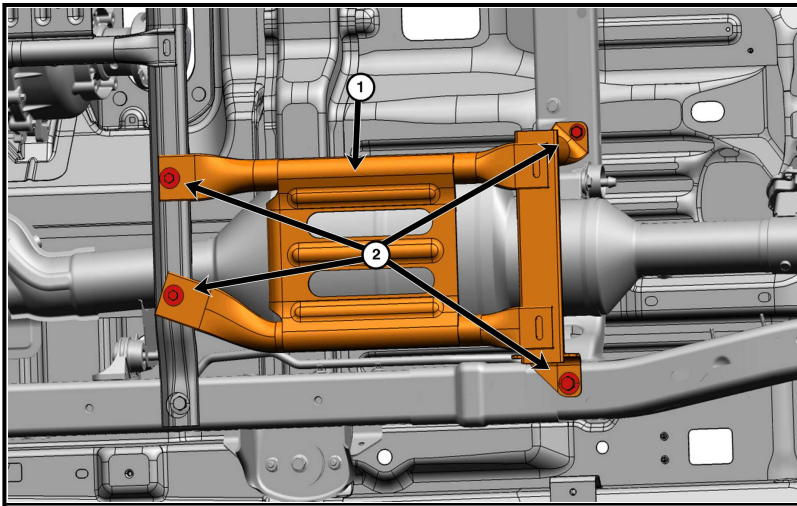
PLATE, SKID

REMOVAL AND INSTALLATION

SCR SKID PLATE

REMOVAL

1. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .



1 - SCR Skid Plate
2 - SCR Skid Plate Bolts

2. Remove the SCR skid plate bolts and remove the skid plate.

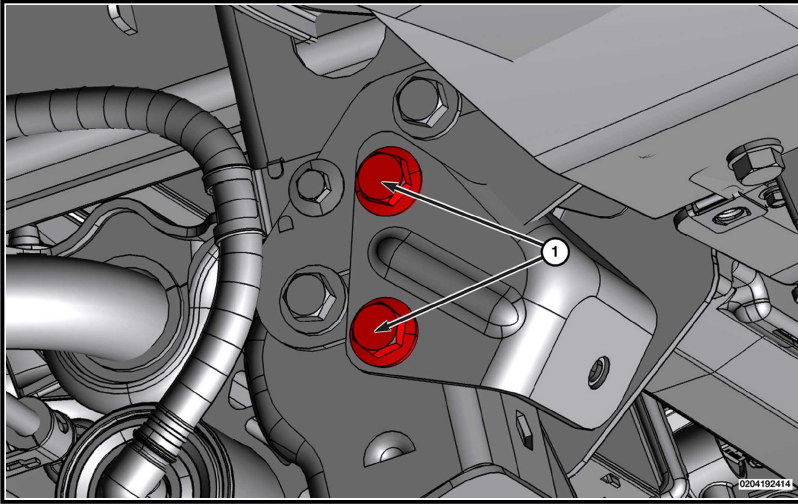
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

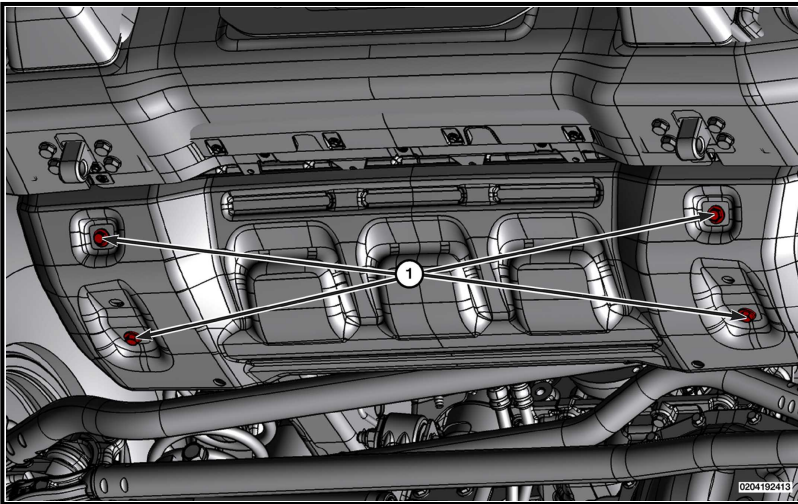
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

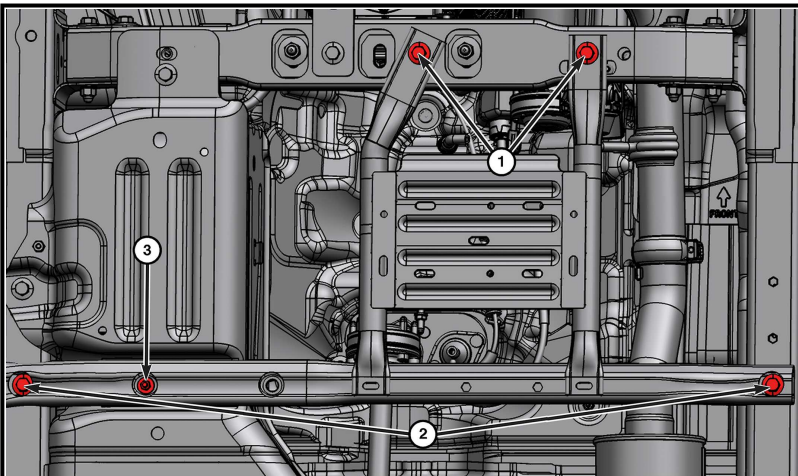
SKID PLATES



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bracket to Frame Bracket Bolts	50 N.m (37 Ft. Lbs.)	-

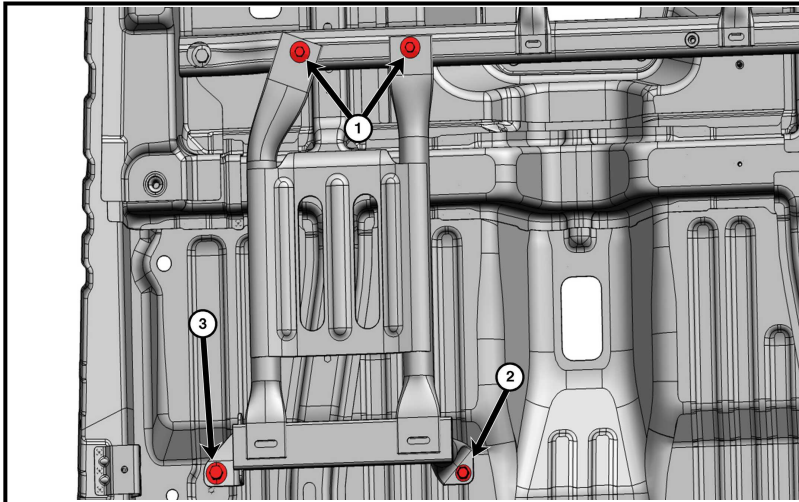


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bolts	25 N.m (18 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Transfer Case Skid Plate Bolts	75 N.m (55 Ft. Lbs.)	-
2	Transfer Case Skid Plate Frame Bolts	75 N.m (55 Ft. Lbs.)	-

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
3	Transfer Case Skid Plate Fuel Tank Nut	20 N.m (15 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	SCR Skid Plate Front Bolts	23 N.m (17 Ft. Lbs.)	-
2	SCR Skid Plate Outer Bolt	62 N.m (46 Ft. Lbs.)	-
3	SCR Skid Plate Inner Bolt	75 N.m (55 Ft. Lbs.)	-

PLATE, SKID, FUEL TANK

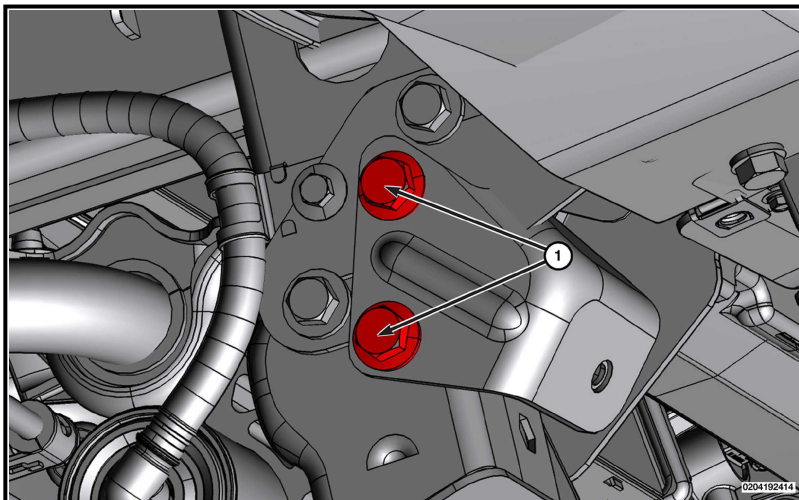
REMOVAL AND INSTALLATION

FUEL TANK SKID PLATE

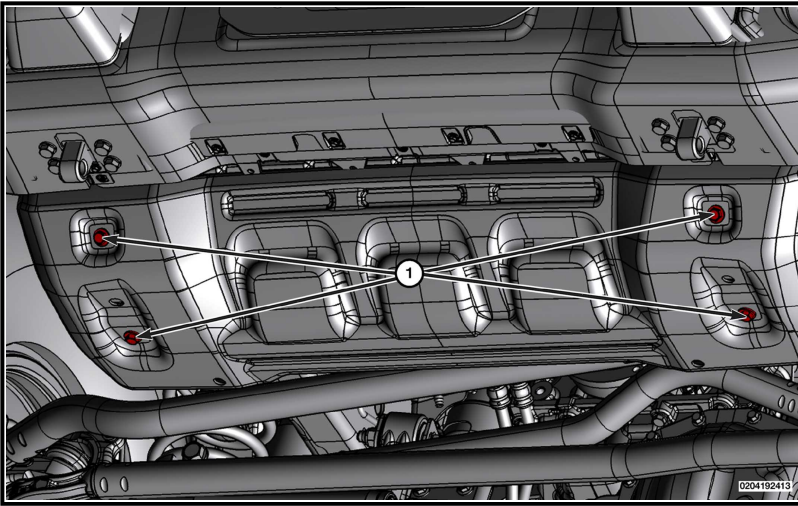
NOTE: The fuel tank skid plate and the fuel tank assembly are removed at the same time. They share common fasteners.

For service procedures. Refer to [3.0L, TANK, FUEL, REMOVAL AND INSTALLATION](#) [3.6L, TANK, FUEL, REMOVAL AND INSTALLATION](#) .

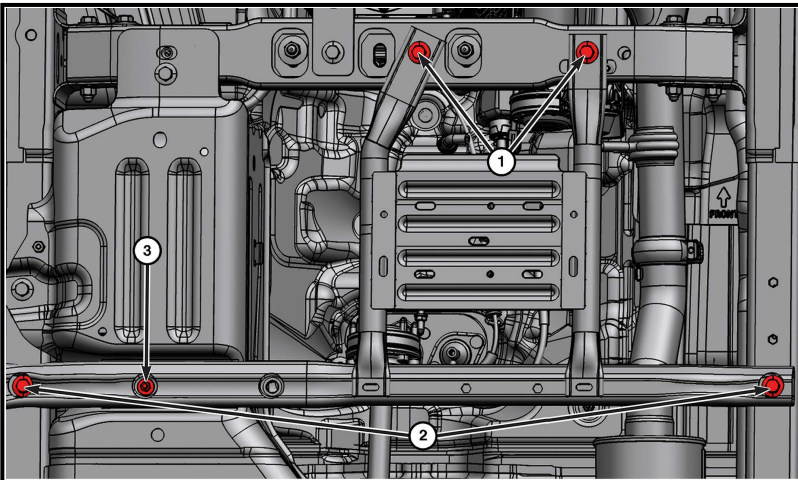
SKID PLATES



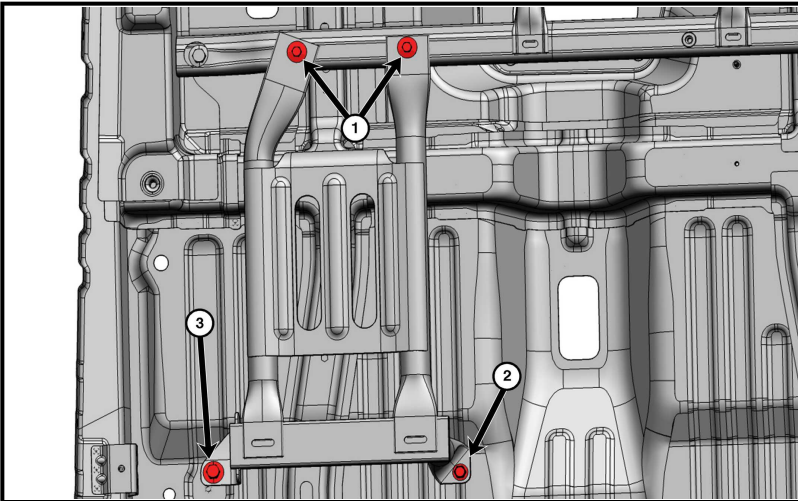
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bracket to Frame Bracket Bolts	50 N.m (37 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bolts	25 N.m (18 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Transfer Case Skid Plate Bolts	75 N.m (55 Ft. Lbs.)	-
2	Transfer Case Skid Plate Frame Bolts	75 N.m (55 Ft. Lbs.)	-
3	Transfer Case Skid Plate Fuel Tank Nut	20 N.m (15 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	SCR Skid Plate Front Bolts	23 N.m (17 Ft. Lbs.)	-
2	SCR Skid Plate Outer Bolt	62 N.m (46 Ft. Lbs.)	-
3	SCR Skid Plate Inner Bolt	75 N.m (55 Ft. Lbs.)	-

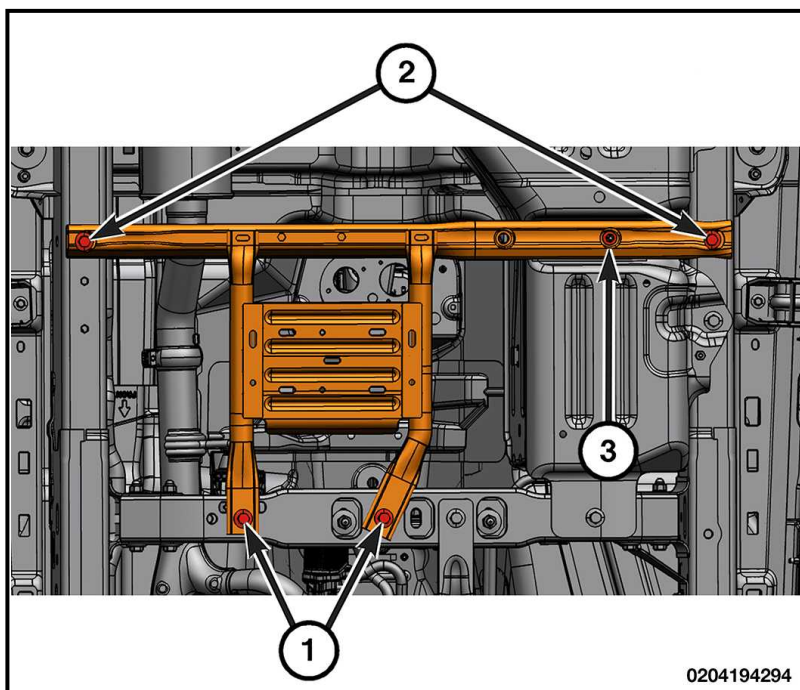
PLATE, SKID, TRANSFER CASE

REMOVAL AND INSTALLATION

TRANSFER CASE SKID PLATE

REMOVAL

1. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .
2. Remove the water separator, if equipped. Refer to [FILTER\(S\), FUEL, REMOVAL AND INSTALLATION](#) .



1 - Transfer Case Skid Plate Bolts
2 - Transfer Case Skid Plate Frame Bolts
3 - Transfer Case Skid Plate Fuel Tank Nut

3. Remove the transfer case skid plate bolts.
4. Remove the transfer case skid plate fuel tank nut.
5. Remove the transfer case skid plate frame bolts and remove the transfer case skid plate.

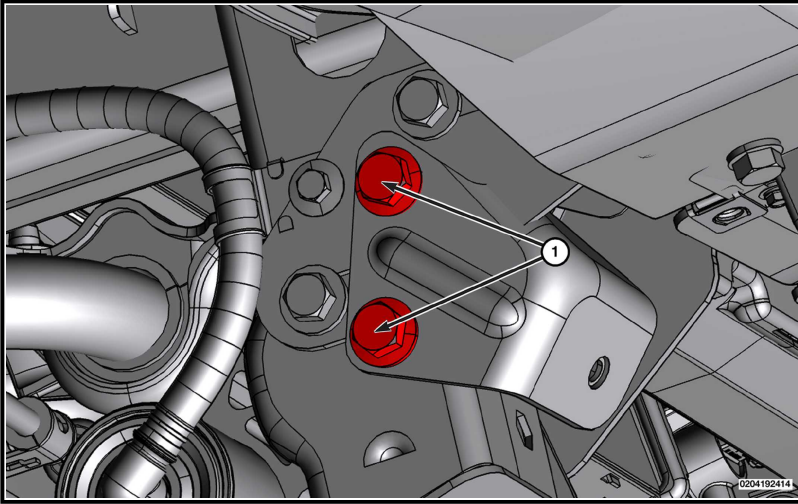
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

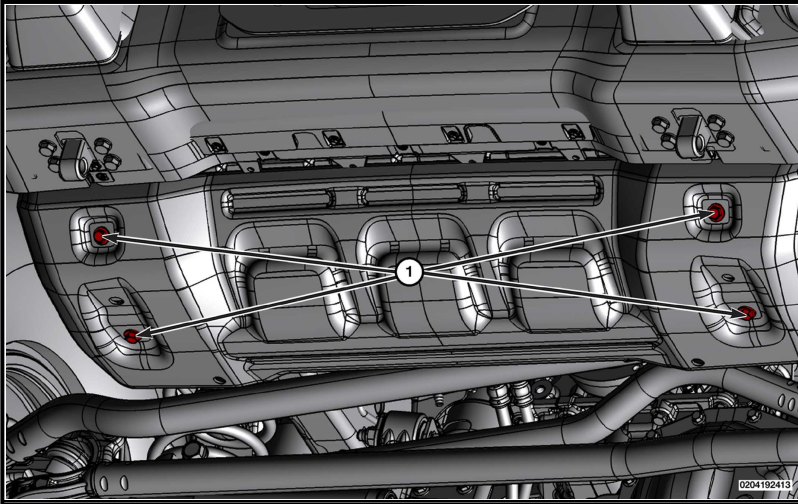
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

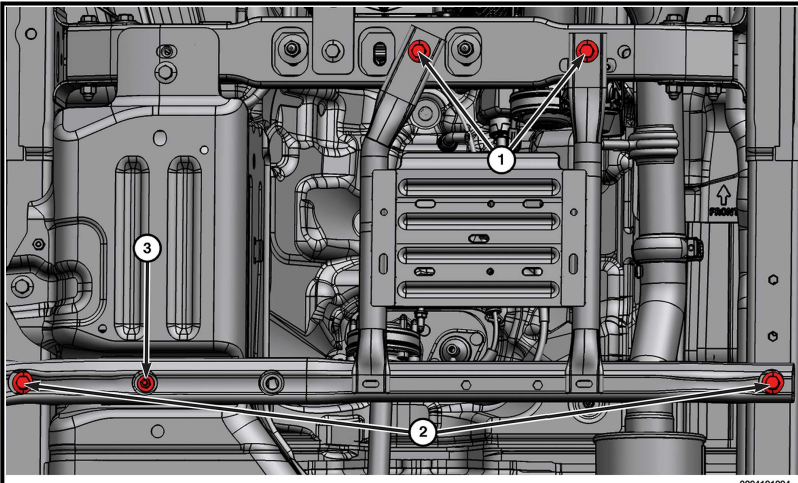
SKID PLATES



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bracket to Frame Bracket Bolts	50 N.m (37 Ft. Lbs.)	-

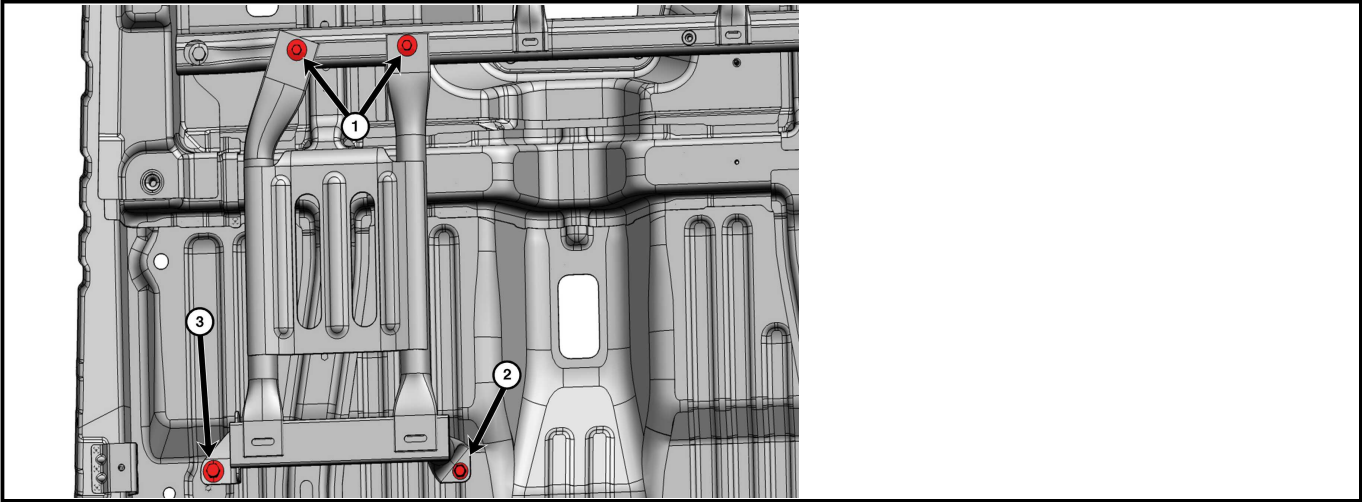


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Front Skid Plate Bolts	25 N.m (18 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Transfer Case Skid Plate Bolts	75 N.m (55 Ft. Lbs.)	-
2	Transfer Case Skid Plate Frame Bolts	75 N.m (55 Ft. Lbs.)	-

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
3	Transfer Case Skid Plate Fuel Tank Nut	20 N.m (15 Ft. Lbs.)	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	SCR Skid Plate Front Bolts	23 N.m (17 Ft. Lbs.)	-
2	SCR Skid Plate Outer Bolt	62 N.m (46 Ft. Lbs.)	-
3	SCR Skid Plate Inner Bolt	75 N.m (55 Ft. Lbs.)	-

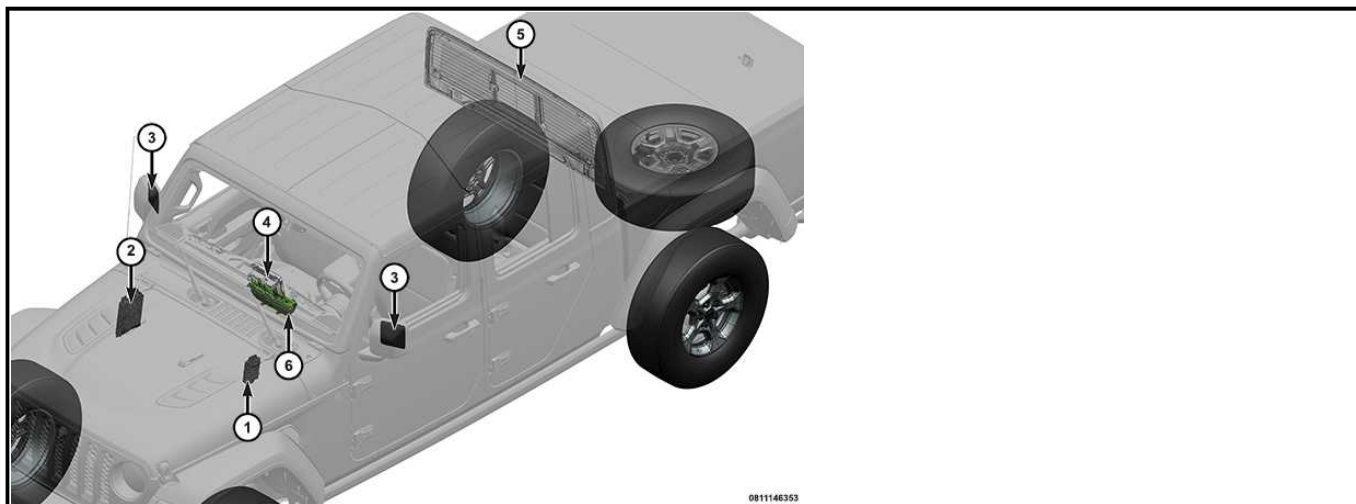
2021 ACCESSORIES AND BODY, CAB

Heated Glass (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Heated Glass system is comprised of several different components. Those components are:

COMPONENT INDEX

1.	Refer to HEATING VENTILATION AND AIR CONDITIONING (HVAC) .
2.	Refer to BODY CONTROL MODULE (BCM) .
3.	Refer to EXTERIOR MIRROR GLASS .
4.	Refer to RADIO - Optional radios contain the Electronic Backlight (EBL) defrost soft switch.
5.	Refer to REAR GLASS .
6.	Refer to INTEGRATED CENTER STACK (ICS) MODULE - Contains the EBL defrost hard switch.

OPERATION

Automatic Temperature Control (ATC) - The automatic defogger system is controlled by momentary soft switches located in the radio climate controls menu. The front or rear defrost switch will illuminate when either switch is to the ON position.

Manual Temperature Control (MTC) - The manual front and rear defogger systems can be controlled by a momentary switch located on the ICS. An amber indicator will illuminate whenever either switch is pushed to the ON position.

Depending on ATC or MTC HVAC:

- ATC - The message is sent from the Radio touch screen over the Controller Area Network (CAN) Interior High Speed (IHS) data bus to the HVAC module which uses a low side driver to actuate the relay in the Power Distribution Center (PDC). Once the ON or OFF request is received and the relay is actuated, the HVAC module commands the ICS amber indicator to illuminate or extinguish, depending on the state of the defrost system (ON/OFF).
- MTC - The lower center stack sends a message to the HVAC module indicating that the ICS defrost button has been toggled ON or OFF. The HVAC module commands the EBL relay ON or OFF by way of a direct hardwired circuit. The ICS receives the proper bounce signal from the HVAC to either illuminate

the amber indicator or extinguish the amber indicator, depending on the state of the defrost system (ON/OFF).

When the defrost switch is turned ON, the HVAC module will activate an initial rear defrost indicator time of roughly ten minutes. The EBL will not operate during the KEY ON Accessory position and will only operate in the Key ON or RUN position.

If the outside mirror heating grids are both inoperative. Refer to [**DIAGNOSIS AND TESTING**](#).

The heating grid behind each outside mirror glass cannot be repaired and the mirror glass must be replaced if inoperative or damaged. Refer to [**MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION**](#) [**MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION**](#) .

EBL Load Shed Strategy

If after an ignition cycle, all the Load Shed signals are set to OFF, the EBL will operate normally. Under fault condition of missing load shed signals on the CAN bus, the last values of load shed signals will be used to keep the on-going actions of HVAC system until load shed signal broadcast resumes. If the load shed signals do not recover, the on-going load shed action of the HVAC will be maintained for the rest of current ignition key cycle.

Rear Defrost (EBL) Functional Requirements:

- The EBL will not function during over battery voltage 16v or higher
- The EBL will not function during low battery voltage of 9v or lower
- The EBL will not function in sleep mode.
- The HVAC system will not need to be "ON" or have blower operation for the EBL to be active.
- The HVAC will request activation of the defrost relay when the Engine is running (**Engine running > 500 RPM**) .

Optional - Heated Mirrors

Electrically heated outside rear view mirrors are optional on some models. Vehicles with this option can be visually identified by the International Control and Display Symbol icon for rear window defogger, which appears on the lower inboard corner of each outside rear view mirror glass.

The heated mirror system only operates in concert with the EBL system, and will automatically turn off after a programmed time interval of about ten minutes as long as the ignition switch is in RUN. After the initial time interval has expired, if the rear window defogger system is turned on again during the same ignition cycle, the heated mirror system will automatically turn off after about five minutes. The heated mirror system will also turn off if the ignition switch is turned to any position other than RUN or by manually pressing the rear window defogger switch a second time.

Circuit protection for the heated mirror system is provided by a fuse located in the PDC.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

The BCM is the configuration master for the vehicle. As the configuration master, the BCM broadcasts configuration data over the bus whenever the ignition is in the RUN state. The BCM also gates messages between the different bus networks that allow the HVAC system to properly function.

Outputs

- HVAC module configurations
- Ignition state - Key in and commanded ignition switch status

- Gated engine speed
- Driver door ajar state
- Vehicle configuration for country code, remote start present and HVAC type
- Averaged ambient temperature
- Outside air temperature
- Battery voltage
- Battery state of charge - load shedding requests
- Gated ESS state
- Gated ESS present
- Type of vehicle start request

EXTERIOR MIRROR GLASS

EXTERIOR MIRROR GLASS

Refer to [COMPONENT INDEX](#).

When the rear window defogger switch is pressed, the rear window defogger EBL system becomes activated and an electric heater grid located behind the glass of each of the outside rear view mirrors is energized. When energized, each of these heater grids produce heat to help clear the outside rear view mirrors of ice, snow, or fog.

HEATING VENTILATION AND AIR CONDITIONING (HVAC)

HEATING VENTILATION AND AIR CONDITIONING (HVAC)

Refer to [COMPONENT INDEX](#).

The HVAC module receives the EBL command from the radio or from the ICS switch and performs the logical management of the EBL relay. The HVAC module receives configuration input and operation function from the BCM.

Inputs

- HVAC module configurations from the BCM
- CAN-IHS EBL Command from Radio
- Ignition state from the BCM - Key in and commanded ignition switch status
- Radio inputs for defrost control - rear defrost ON/OFF toggles requests
- ICS EBL pressed input for defrost control
- Gated engine speed from the BCM
- Driver door ajar state from the BCM
- Vehicle configuration from the BCM for country code, remote start present and HVAC type
- Averaged ambient temperature from the BCM
- Outside air temperature from the BCM
- Battery voltage from the BCM
- Battery state of charge from the BCM - load shedding requests
- Gated ESS state from the BCM
- Gated ESS present from the BCM
- Type of vehicle start request from the BCM

Outputs

- EBL relay command - this is a hardwired signal to the relay
- EBL control

- ESS disable request to the BCM gated to the Powertrain Control Module (PCM)
- HVAC EBL state
- HVAC defrost select switch

INTEGRATED CENTER STACK (ICS) MODULE

INTEGRATED CENTER STACK (ICS) MODULE

Refer to [COMPONENT INDEX](#).

The ICS houses the hard EBL defrost switch and directly outputs to the HVAC module upon actuation.

RADIO

RADIO

Refer to [COMPONENT INDEX](#).

The radio touch screen houses the EBL defrost soft button and when actuated, will send the request to the HVAC module.

Inputs

- Vehicle configuration from the BCM
- EBL soft switch illumination and extinguish requests from a HVAC module CAN-IHS signal

Outputs

- Sends the soft switch EBL request to the HVAC module.

REAR GLASS

REAR GLASS

Refer to [COMPONENT INDEX](#).

When energized, the EBL high side driver provides battery current to the rear window defogger grid lines. The grid lines heat the glass to help clear the rear window surface of fog or frost.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ELECTRIC BACK LIGHT (EBL) SYSTEM

NOTE: Prior to any Diagnostics being performed, make sure that the removable hard top, if equipped, is properly installed. If the top is not properly installed the rear Defogger (EBL) will not work.

NOTE: Illumination of the rear window defogger indicator lamp in the instrument cluster does not necessarily mean that electrical current is reaching the rear window glass heating grid.

NOTE: Refer to the Wiring Information for circuit descriptions and diagrams.

Operation of the EBL system can be confirmed by the following:

1. Before doing any testing. If the vehicle is equipped with a removable hard top, verify that the hard top is properly installed on the vehicle. There is a roof presence detection sense circuit that the Body Control Module (BCM) monitors that will be open if the top is not properly installed to the body. If the top is properly installed and the EBL is still not operational, then check the roof presence detection sense circuit for an open.

2. Use a scan tool and check for Diagnostic Trouble Codes (DTCs) monitored by the Heating Ventilation and Air Conditioning (HVAC) Module. If any DTCs are found, repair as required. Depending on the DTCs, the rear defog may not be allowed to activate.
3. Turn the ignition to RUN and press the rear window defogger switch to on. Rear window defogger operation can be checked by feeling the surfaces of the rear window glass. A distinct difference in temperature between the grid lines and the adjacent clear glass should be detected within three to four minutes of operation.
4. If a temperature difference is not detected, use a 12 volt Direct Current (DC) voltmeter and contact the rear glass heating grid terminal with the negative lead, and connector terminal with the positive lead. The voltmeter should read battery voltage. If the voltmeter does not read battery voltage, check the following:
 - Confirm the ignition is in RUN.
 - Confirm the rear window defogger switch is being read by the BCM (there is no DTC to indicate a failed switch or open switch connection). Using the scan tool find the rear defog monitor in the HVAC module data. Press and release the rear defog switch while monitoring; if the HVAC input monitor does not toggle (ON/OFF) repair the open connection between the switch and HVAC or replace the failed switch.
 - Confirm the EBL feed wire is connected to the heating grid positive terminal and that there is continuity between the heating grid and the EBL relay in the Power Distribution Center (PDC).
 - Confirm the EBL ground wire is connected to the heating grid negative terminal and that there is continuity to ground.
 - Confirm the EBL relay in the PDC is operational. Refer to the Wiring Information.
5. If broken defogger grid lines or bus bars are suspected, use a 12 volt DC voltmeter to diagnose the grids and repair the open grid line(s) or bus bar(s).

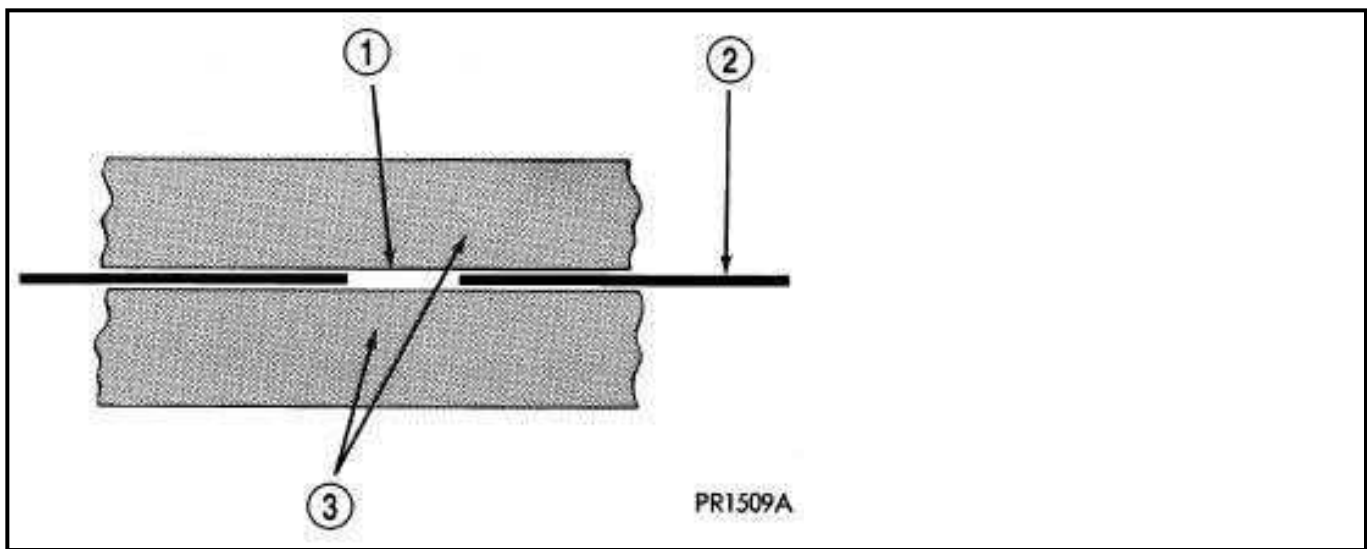
GRID, DEFOGGER

STANDARD PROCEDURE

STANDARD PROCEDURE - GRID LINE AND TERMINAL REPAIR

WARNING: Materials contained in the Repair Kit may cause skin or eye irritation. The kit contains epoxy resin and amine type hardener, which are harmful if swallowed. Avoid contact with the skin and eyes. For skin contact, wash the affected areas with soap and water. For contact with the eyes, flush with plenty of water. Do not take internally. If taken internally, induce vomiting and call a physician immediately. Use with adequate ventilation. Do not use near fire or flame. Contains flammable solvents. Keep out of the reach of children. Failure to follow these instructions may result in serious or fatal injury.

NOTE: Repair of the rear glass heating grid lines, bus bars, terminals or pigtail wires can be accomplished using commercially available products. For terminal repairs, use Frost FighterB® 2000 Defroster Tab Repair Kit or equivalent.



1. Mask the repair area with masking tape (3) so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the grid line (2) or the bus bar on each side of the break (1).
2. Follow the instructions in the repair kit for preparing the damaged area.
3. Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.
4. Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 millimeters (0.75 inch).
5. For a terminal or pigtail wire replacement, sand the flux off the replacement tab with the sandpaper provided in the kit.
6. Prep the surface where the terminal was attached and that of the defrost bus bar with sandpaper (320 grit supplied in kit) or emery cloth.
7. Wipe the repair area with Acetone (or equivalent) to remove any residual oil or contaminants.
8. Mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as the bus bar.
9. Dispense equal parts of the bonding epoxy from the defroster repair kit. Mix the epoxy for approximately 45 seconds or until thoroughly combined.
10. Apply a thin layer of epoxy to the area where the terminal or pigtail wire was fastened and onto the adjacent grid line.
11. Apply a thin layer of conductive epoxy to the terminal or bare wire end of the pigtail and place it in the proper location on the bus bar. To prevent the terminal or pigtail wire from moving while the epoxy is curing, it must be wedged or clamped.
12. Carefully remove the masking tape or template.

CAUTION: Do not allow the glass surface to exceed 204B° C (400B° F) when using a heat gun, or the glass may fracture.

13. Apply light heat from a heat gun (or equivalent) for 30 minutes.
14. Allow the epoxy to cure 24 hours at room temperature, or carefully use a heat gun for 15 minutes. When using a heat gun, hold it approximately 254 mm (10 in) from the repair and do not allow the glass surface to exceed 204B° C (400B° F).
15. After allowing the glass to cool down for 10 minutes, recheck the epoxy to the repaired area to verify that it set and has firmed up.
16. Allow the epoxy to cure for 24 hours at approximately 24 C (75 F) or at room temperature, before reattaching the rear defroster connector.
17. After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail wire.
18. Connect the wire harness leads to the grid terminals or pigtail wires and verify Electric Backlight (EBL) operation.

19. Test the repair by turning on the defroster and then place your hand over the repair site on the outside of the glass.
20. If the repair gets hot, turn off the defroster, apply more adhesive bridging to the tab and to the defroster. Repeat as needed.

SWITCH, DEFOGGER

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The rear defogger switch is located in the Integrated Center Stack (ICS) Module. The rear defogger switch cannot be adjusted or repaired, if the rear defogger switch or indicator Lamps are inoperative or damaged, the entire ICS must be replaced. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .

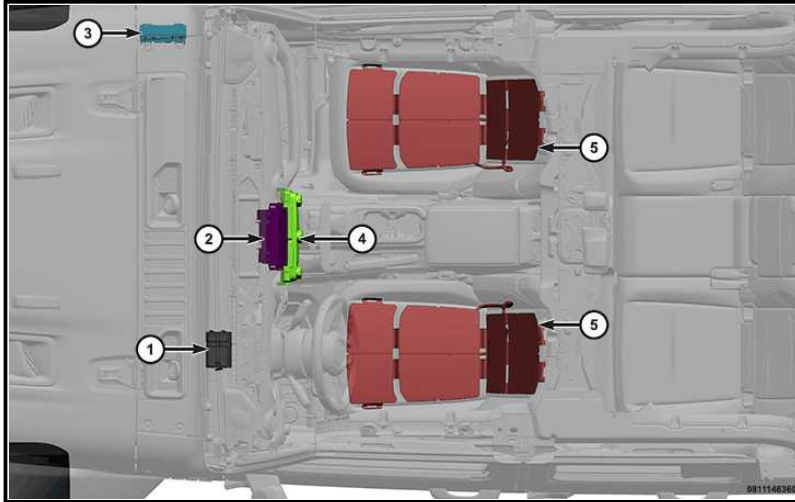
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Heated Seats (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Heated Seats system is comprised of several different components. Those components are:

COMPONENT INDEX

1.	Refer to COMFORT SEAT AND WHEEL MODULE (CSWM) .
2.	Refer to RADIO - Certain Radios contain a soft button heated seat switch.
3.	Refer to BODY CONTROL MODULE (BCM) .
4.	Refer to INTEGRATED CENTER STACK (ICS) MODULE - Contains that hard button heated seat switch.
5.	Refer to HEATED SEAT PAD ELEMENTS - Seat bottom and seat back.

OPERATION

Vehicles with the heated seat option can be visually identified by the two heated seat switches located in the ICS in the center of the instrument panel. The heated seat system allows the driver and front seat passenger to select from three different levels of heat (low, medium, and high).

The heated seat system operates on battery current received through fused ignition switch output (RUN) circuits, so that the heated seat system will only operate when the engine is running. The heated seat system will turn OFF automatically whenever the engine is turned OFF.

A CSWM is used to control the heated seat system. The CSWM responds to heated seat switch messages and ignition switch status inputs by controlling the 12 volt Direct Current (DC) output to the front seat heating elements through integral solid-state relays.

When either of the ICS hard button heated seat switches are pressed, a switch status message is sent from the ICS over the Controller Area Network-Interior High Speed (CAN-IHS) data bus to the CSWM which signals the CSWM to energize the heating element for the selected seat. Amber Light Emitting Diodes (LED) in each switch indicate the level of heat in use:

- One amber LED indicator - Low
- Two amber LED indicators - Medium
- Three amber LED indicators - High

The CSWM sends the LED illumination message to the ICS over the CAN-IHS data bus.

The CSWM supplies Pulse Width Modulated (PWM) current to the heated seat elements. When high-temperature heating is selected, the heating elements provide a boosted heat level during the first four minutes of operation after heating is activated. The heat output then drops to the normal high-temperature level. If high-level heating is selected, the CSWM will automatically switch to the low level after two hours of continuous operation. At that time, the number of illuminated LEDs changes from three to one, indicating the change. Operation on the low setting also turns off automatically after two hours.

The CSWM provides power to and monitors return signals from a heated seat thermistor to monitor and manage the heat level of the heated seats. The heated seat module will automatically turn off the heating elements if it detects an open or low short in the heating element circuit.

For vehicles equipped with Engine Stop Start (ESS) functionality, the CSWM will deactivate the heated seats during a ESS event if the battery voltage dips below 9v. Once the battery has reached 9.5v, the CSWM reactivated all the heated outputs to the same levels they were operating at prior to the voltage dip.

Drive Comfort System Feature

The Drive Comfort System feature is customer programmable. This system has three settings:

1. Remote start only - When the remote start only feature is enabled, the CSWM activates the driver heated seat during a remote start vehicle engine start event only based on ambient temperature.
2. Remote start and normal start - When the remote start and normal start feature is enabled, the CSWM activates the driver heated seat during both remote and normal vehicle engine start events based on ambient temperature. The ambient temperature will need to be less than 4.4 B°C (40 B°F).
3. Disabled - If the Driver Comfort System feature is disabled, the CSWM will only activate the driver heated seat when the customer activates the system.

If the ambient temperature is less than 4.4 B°C (40 B°F), the CSWM will set the heated seats to HIGH and will continue with control of the heated seats for a specified period of time. After this time has expired, normal CSWM heated seat operation will resume. If the ambient temperature is above 4.4 B°C (40 B°F) when the engine start event occurs, normal CSWM heated seat operation will commence. The Driver Comfort System feature default setting is set to "Remote start and normal start".

Load Shedding - The heated seat outputs participate in the load shed reduction strategy. The CSWM monitors several bus signals to determine which type of load shedding is needed, if any. There are four levels of load shed reduction strategy and the CSWM responds differently to each level:

1. Level 1 - If output is active, no change will occur. The CSWM retains the current setting(s).
2. Level 2 - If the output is active and the setting is Low, the CSWM will behave normally. If the output is High or Medium, the CSWM will turn off the PWM signal until the temperature reaches the low steady state. Once the low steady state has been achieved, the CSWM resumes its timer operation and diagnostic monitoring of the heated seat system.
3. Level 3 **or** Level 7- If the outputs are active, the CSWM sets these outputs to not active. If the outputs are already inactive, the CSWM prevents this state from changing to active until the load shed event has completed.

The heated seat control system is diagnosed using a scan tool. Refer to [**DIAGNOSIS AND TESTING**](#) .

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

The BCM is the configuration master and the gateway master for the vehicle. The BCM provides various input feeds to the CSWM for heated seat functional purposes.

Inputs

- Internal input commanded ignition state

Outputs

- Vehicle configuration data to the CSWM
- Vehicle configuration data to the Radio
- Gated ESS information to the CSWM
- Heated seat type and configuration to the CSWM
- Ignition state to the CSWM, ICS and Radio
- Remote Start active to the CSWM
- Average ambient temperature to the CSWM
- Engine run state gated to the CSWM
- Load shed strategy to the BCM
- ICS present configuration to the CSWM

COMFORT SEAT AND WHEEL MODULE (CSWM)

COMFORT SEAT AND WHEEL MODULE (CSWM)

Refer to [COMPONENT INDEX](#).

A CSWM is used to control the heated seat system. The CSWM responds to heated seat switch messages and ignition switch status inputs by controlling the 12 volt DC output to the front seat heating elements through integral solid-state relays.

When either of the ICS hard button heated seat switches are pressed, a switch status message is sent from the ICS over the CAN-IHS data bus to the CSWM which signals the CSWM to energize the heating element for the selected seat. Amber LED in each switch indicate the level of heat in use:

- One amber LED indicator - Low
- Two amber LED indicators - Medium
- Three amber LED indicators - High

The CSWM sends the LED illumination message to the ICS or Radio over the CAN-IHS data bus.

The CSWM supplies PWM current to the heated seat elements. When high-temperature heating is selected, the heating elements provide a boosted heat level during the first four minutes of operation after heating is activated. The heat output then drops to the normal high-temperature level. If high-level heating is selected, the CSWM will automatically switch to the low level after two hours of continuous operation. At that time, the number of illuminated LEDs changes from three to one, indicating the change. Operation on the low setting also turns off automatically after two hours.

The CSWM provides power to and monitors return signals from a heated seat thermistor to monitor and manage the heat level of the heated seats. The heated seat module will automatically turn off the heating elements if it detects an open or low short in the heating element circuit.

For vehicles equipped with ESS functionality, the CSWM will deactivate the heated seats during a ESS event if the battery voltage dips below 9v. Once the battery has reached 9.5v, the CSWM reactivated all the heated outputs to the same levels they were operating at prior to the voltage dip.

Inputs

- ICS hard button requests
- Heated seat temperature

- Heated seats configuration
- Vehicle interior temperature signal from the Radio
- CAN-IHS ICS Module equipped
- Load shed active and level
- Ignition state from the BCM
- Remote start active from the BCM
- Average ambient temperature from the BCM
- ESS present gated from the BCM
- ESS state gated from the BCM
- Heated seat soft button requests from the Radio
- Vehicle configuration from the BCM
- Heated seats thermistor values for seat cushion and seat back
- Engine run state gated from the BCM

Outputs

- Heated seat state to the ICS
- Remote start/normal start signal to the Radio
- Remote start signal to the Radio
- Hardwired PWM power feed to the seat cushion and seat back
- Hardwired temperature command feed to the thermistors

HEATED SEAT PAD ELEMENTS

HEATED SEAT PAD ELEMENTS

Refer to [COMPONENT INDEX](#).

Vehicles equipped with the optional heated seat system have four heated seat elements. One heating element is used for each front seat bottom cushion and another heating element is used for each front seat back cushion.

All of the heated seat elements consist of multiple heating circuits operating in parallel throughout the element and a wire lead and connector. The heated seat elements are captured between the seat cushion and seat cover.

INTEGRATED CENTER STACK (ICS) MODULE

INTEGRATED CENTER STACK (ICS) MODULE

Refer to [COMPONENT INDEX](#).

The ICS can include two monetary non latching hard buttons for the heated seats activation/deactivation. There is one switch for each front heated seat. These switches have two states, pressed (ON) and not pressed (OFF). These switches have three levels of indicators to display the specific level of seat heating. The ICS is placed on the CAN-IHS bus for communication with the CSWM.

Inputs

- Internal input from the hard button heated seat switch located on the ICS
- Heated seat status signals from the CSWM

Outputs

- CAN-IHS messages containing the hard button heated seat switch ON/OFF requests to the CSWM
- Internal output to the hard button heated seat switch for LED illumination strategy

RADIO

RADIO

Refer to [COMPONENT INDEX](#).

Certain radios allow for a climate control touch screen menu that includes a left and right side front heated seat soft button. When this button is pressed, a CAN-IHS signal is sent to the CSWM for the selected heated seats operation.

The Radio also contains the customer programmable Drive Comfort System Feature menu options that include heated seat operation under engine start events.

Inputs

- Remote start/normal start signal from the CSWM
- Remote start signal from the CSWM
- Heated seat status signals from the CSWM
- Configuration data from the BCM

Outputs

- Soft button heated seat switch ON/OFF requests to the CSWM

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HEATED SEAT SYSTEM

NOTE: Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.7 volts or above 15.5 volts. Be certain to check the vehicle electrical system for proper voltage anytime the heated seat system appears inoperative.

NOTE: If a Diagnostic Trouble Code (DTC) can not be verified, it is a good indication that an intermittent fault condition may be present. To help find an intermittent problem, sit in the seat in question and move around the heating elements within the seat while testing continuity. Wiggle the heated seat wire harness and electrical connectors while testing continuity.

NOTE: For complete circuit diagrams, see Wiring Information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

Before testing any individual components in the heated seat system, check the following:

- Check the vehicles battery open-circuit voltage and charging system performance. If the vehicle's electrical system is ineffective or weak it may not be supplying sufficient energy to operate the heated seat system.
- Using a scan tool, check for any Diagnostic Trouble Codes (DTCs) related to the Body Control Module (BCM) and the heated seat switches. If any DTCs are found, repair as necessary. Refer to [DIAGNOSIS AND TESTING](#) .
- If there are no DTCs and a front heated seat does not operate properly, verify heated seat relay operation, and repair as necessary.

- If there are no DTCs and the front seat heating elements are receiving battery power and have a good ground, test the seat heating elements for proper operation, and repair as necessary.

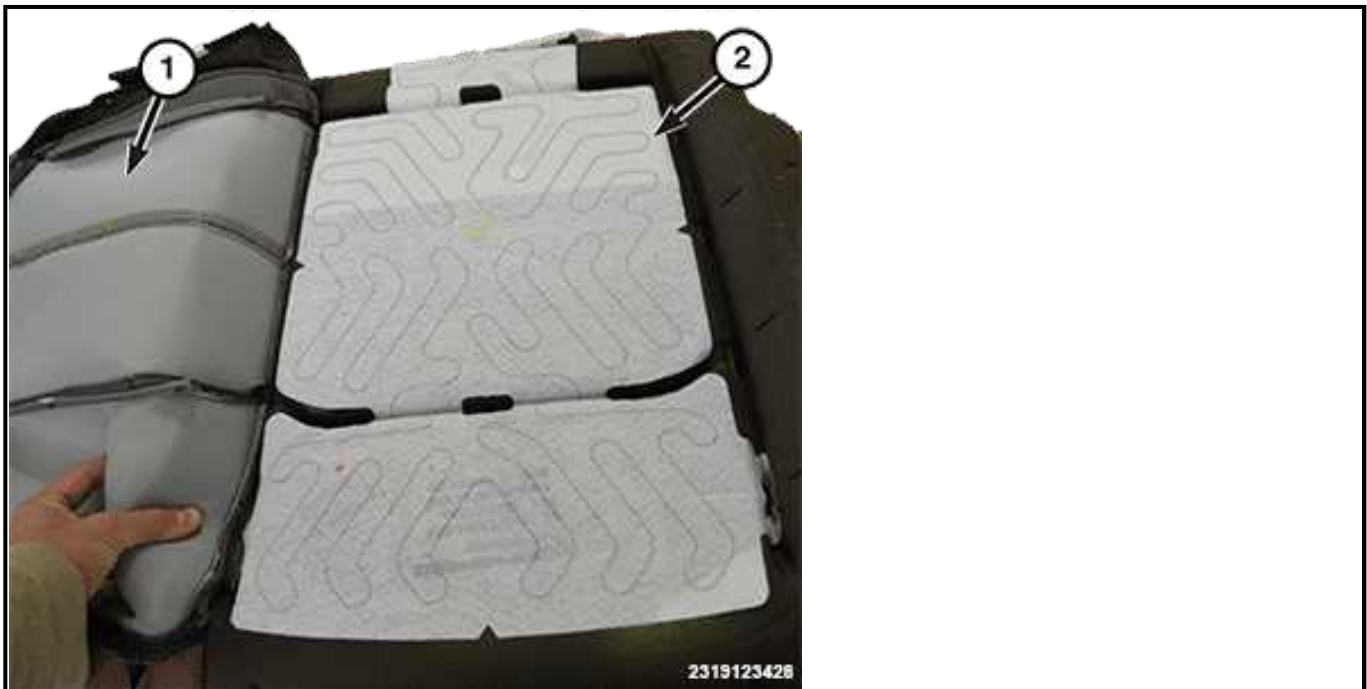
PAD, HEATER, CUSHION

REMOVAL AND INSTALLATION

SEAT CUSHION

NOTE: For passenger seat this is very important: As a standard practice, any repairs or maintenance to the seat cushion (Trim replacement, Seat Heater, Foam repair) requires replacement of the OCM (Occupant Classification Module) or ODS (Occupant Detection Sensor) and seat cushion together. The OCM or ODS is calibrated to the replacement foam and trim at the service kit supplier. The OCM or ODS service kits come together with the seat foam, trim material, and seat heater if equipped.

NOTE: This procedure only applies to the drivers seat.



REMOVAL

1. Remove the seat cushion cover (1). Refer to [COVER, SEAT CUSHION, REMOVAL AND INSTALLATION COVER, REAR SEAT CUSHION, 40%, REMOVAL AND INSTALLATION COVER, REAR SEAT CUSHION, 60%, REMOVAL AND INSTALLATION](#) .
2. Set the cushion aside to be used as a guide to install a new heater pad (2) to a new cushion. Discard the cushion when this procedure is complete.

NOTE: The heated pad cannot be removed from the cushion, the service kit will include a NEW heater pad and NEW cushion.

INSTALLATION

1. Peel off the adhesive backing from the new heater pad.

CAUTION: During heated seat element replacement, be careful not to fold or crease the new heating element. Folds or creases will cause premature heated seat element failure.

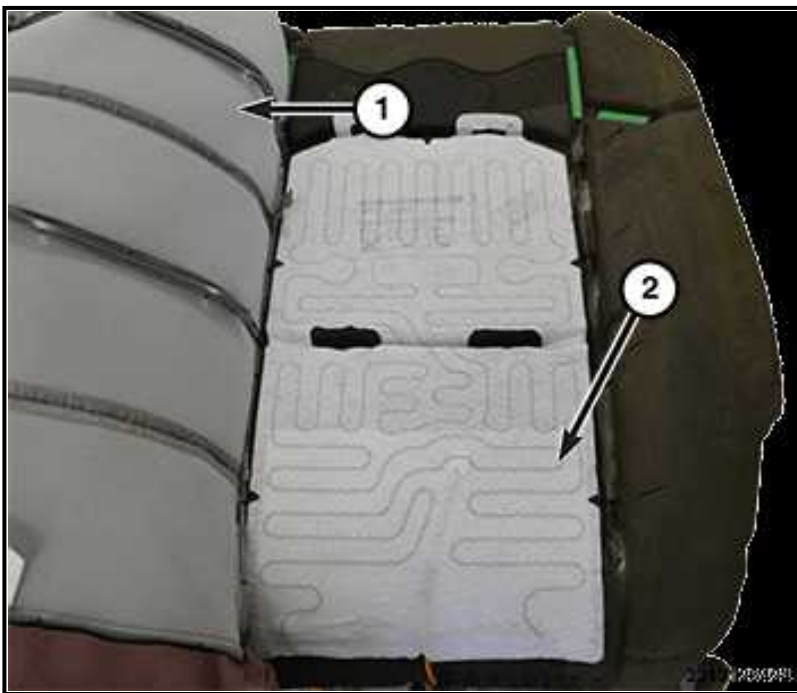
2. Position the new heater pad to the new cushion in the same location as on the original cushion. Make sure the wire harness is correctly routed.
3. Firmly press the new heater pad to the cushion. Make sure the adhesive is fully adhered to the cushion.
4. Install the seat cover. Refer to [COVER, SEAT CUSHION, REMOVAL AND INSTALLATION](#) [COVER, REAR SEAT CUSHION, 40%, REMOVAL AND INSTALLATION](#) [COVER, REAR SEAT CUSHION, 60%, REMOVAL AND INSTALLATION](#) .
5. Verify proper heated seat system operation.

SEAT BACK

REMOVAL

1. Remove the seat back cover (1)

Refer to [COVER, SEAT BACK, REMOVAL AND INSTALLATION](#) [COVER, SEAT BACK SECOND ROW 40%, REMOVAL AND INSTALLATION](#) [COVER, SEAT BACK SECOND ROW 60%, REMOVAL AND INSTALLATION](#) .



2. Using a heat gun, carefully warm the heater pad (2) to loosen the adhesive and slowly peel the heater pad from the cushion.

NOTE: If the cushion is damaged during removal of the heater pad, it must be replaced with a NEW cushion.

3. For installation reference, make note of the position of the heated seat element and the routing of the wire lead and connector on the cushion being serviced.

INSTALLATION

1. Peel off the adhesive backing from the new heater pad.

CAUTION: During heated seat element replacement, be careful not to fold or crease the new heating element. Folds or creases will cause premature heated seat element failure.

2. Position the new heater pad to the cushion in the same location as on the original cushion. Make sure the wire harness is correctly routed.

3. Firmly press the new heated seat element to the cushion. Make sure the adhesive is fully adhered to the cushion.
4. Install the seat cover. Refer to **COVER, SEAT CUSHION, REMOVAL AND INSTALLATION** **COVER, REAR SEAT CUSHION, 40%, REMOVAL AND INSTALLATION** **COVER, REAR SEAT CUSHION, 60%, REMOVAL AND INSTALLATION** .
5. Verify proper heated seat system operation.

SWITCH, HEATED SEAT

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The heated seat switches are located in the Integrated Center Stack (ICS) module. The ICS cannot be adjusted or repaired. If a heated seat switches or indicator lamps are inoperative or damaged, the entire ICS must be replaced. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .

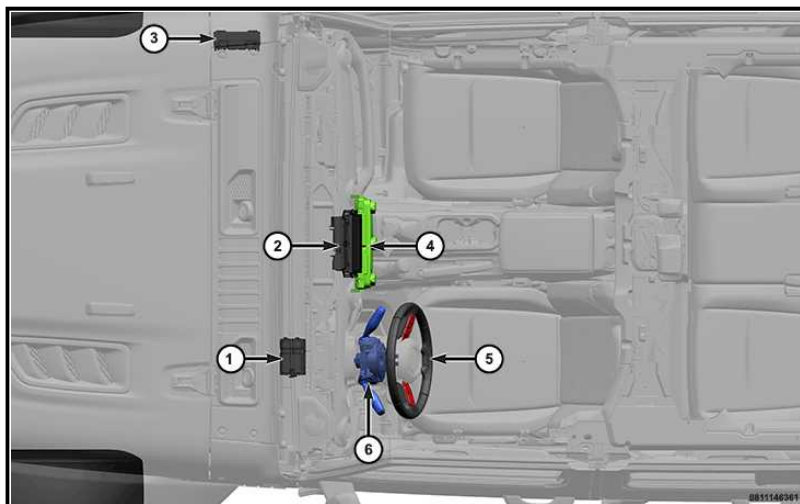
2021 GENERAL INFORMATION

Heated Steering Wheel- Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Heated Steering Wheel system is comprised of several different components. Those components are:

COMPONENT INDEX

1.	Refer to <u>COMFORT SEAT AND WHEEL MODULE (CSWM).</u>
2.	Refer to <u>RADIO</u> - Certain radios contain a soft button heated steering wheel switch.
3.	Refer to <u>BODY CONTROL MODULE.</u>
4.	Refer to <u>INTEGRATED CENTER STACK (ICS) MODULE</u> - Contains the hard button heated steering wheel switch.
5.	Refer to <u>HEATED STEERING WHEEL.</u>
6.	Refer to <u>STEERING COLUMN CONTROL MODULE WITH STEERING WHEEL SWITCH.</u>

OPERATION

The heated steering wheel system is designed to enhance the thermal comfort of the driver by heating the steering wheel, when desired. The steering wheel heating element is made of copper wire and is inserted between the leather and the substrate material of the steering wheel. A vehicle with a heated steering wheel can easily be identified by the heated steering wheel switch located in the ICS, at the center of the instrument panel or, when equipped, within the radio climate control touch screen. When the heated steering wheel switch is pressed on, the heated steering wheel switch illuminates.

The Auto ON feature is a customer configurable feature that, when enabled, will activate the driver heated seat and heated steering wheel on engine start based on ambient temperature. If Auto ON feature is enabled, and the ambient temperature is at or below 4B°C (40B°F) the CSWM will activate the driver heated seat and heated steering wheel feature at the high level after engine start. This feature also works with remote start.

The heated steering wheel system is diagnosed using a scan tool. efer to **DIAGNOSIS AND TESTING** . The steering wheel heating element is not serviced separately from the steering wheel and if inoperative or damaged, the entire steering wheel assembly must be replaced. efer to **WHEEL, STEERING, EMOVAL AND INSTALLATION** .

For vehicles equipped with Engine Stop Start (ESS) functionality, the CSWM will deactivate the heated seats and steering wheel during a ESS event if the battery voltage dips below 9v. Once the battery has reached 9.5v, the CSWM reactivated all the heated outputs to the same levels they were operating at prior to the voltage dip.

Drive Comfort System Feature

The Drive Comfort System feature is customer programmable. This system has three settings:

1. Remote start only - When the remote start only feature is enabled, the CSWM activates the driver heated seat and steering wheel outputs during a remote start vehicle engine start event only based on ambient temperature.
2. Remote start and normal start - When the remote start and normal start feature is enabled, the CSWM activates the driver heated seat and steering wheel during both remote and normal vehicle engine start events based on ambient temperature. The ambient temperature will need to be less than 4.4 B°C (40 B°F).
3. Disabled - If the Driver Comfort System feature is disabled, the CSWM will only activate the driver heated seat and steering wheel when the customer activates the system.

If the ambient temperature is less than 4.4 B°C (40 B°F), the CSWM will set the heated seats and steering wheel to HIGH and will continue with control of the heated seats and steering wheel for a specified period of time. After this time has expired, normal CSWM heated seat and steering wheel operation will resume. If the ambient temperature is above 4.4 B°C (40 B°F) when the engine start event occurs, normal CSWM heated seat and steering wheel operation will commence. The Driver Comfort System feature default setting is set to "Remote start and normal start".

Load Shedding - The heated seat and steering wheel outputs participate in the load shed reduction strategy. The CSWM monitors several bus signals to determine which type of load shedding is needed, if any. There are four levels of load shed reduction strategy and the CSWM responds differently to each level:

1. Level 1 - If output is active, no change will occur. The CSWM retains the current setting(s).
2. Level 2 - If the output is active and the setting is Low, the CSWM will behave normally. If the output is High or Medium, the CSWM will turn off the PWM signal until the temperature reaches the low steady state. Once the low steady state has been achieved, the CSWM resumes its timer operation and diagnostic monitoring of the heated seat and steering wheel system.
3. Level 3 or level 7- If the outputs are active, the CSWM sets these outputs to not active. If the outputs are already inactive, the CSWM prevents this state from changing to active until the load shed event has completed.

The heated seat and steering wheel control system is diagnosed using a scan tool. Refer to [**DIAGNOSIS AND TESTING**](#).

BODY CONTROL MODULE

BODY CONTROL MODULE

Refer to [**COMPONENT INDEX**](#).

The BCM provides gateway functionality for certain heated steering wheel input signals between the SCCM and the CSWM. The BCM is also the vehicle configuration master.

Inputs

- Internal input commanded ignition state
- Heated steering wheel temperature sensor status from the steering wheel switch over the LIN bus
- Heated steering wheel temperature from the steering wheel switch over the LIN bus

Outputs

- Vehicle configuration data to the CSWM
- Vehicle configuration data to the Radio
- Gated ESS information to the CSWM
- Heated seat type with heated steering configuration to the CSWM
- Ignition state to the CSWM, ICS and Radio
- Remote Start active to the CSWM
- Average ambient temperature to the CSWM
- Engine run state gated to the CSWM
- Load shed strategy to the BCM
- ICS present configuration to the CSWM
- Steering wheel temperature sensor state and steering wheel temperature signal to the CSWM

COMFORT SEAT AND WHEEL MODULE (CSWM)

COMFORT SEAT AND WHEEL MODULE (CSWM)

Refer to COMPONENT INDEX .

For heating the steering wheel, the CSWM shall provide power and return to the steering wheel heating element using hardwired signals through the SCCM. In order to achieve temperatures based on three configurable settings (High, Medium, Low), the CSWM uses hardwired PWM control signals. The CSWM regulates the steering wheel heated PWM outputs using a closed loop feedback controller. The CSWM allows control of the heated steering wheel independent of the heated seats.

Inputs

- ICS hard button requests
- Heated steering wheel temperature sensor data from the BCM
- Heated steering wheel temperature from the BCM
- Heated Seats with heated steering wheel configuration
- Vehicle interior temperature signal from the Radio
- CAN-IHS ICS Module equipped
- Load shed active and level
- Ignition state from the BCM
- Remote start active from the BCM
- Average ambient temperature from the BCM
- ESS present gated from the BCM
- ESS state gated from the BCM
- Heated steering soft button requests from the Radio
- Vehicle configuration from the BCM
- Engine run state gated from the BCM

Outputs

- Heated steering wheel state to the ICS
- Heated steering wheel state to the Radio
- Remote start/normal start signal to the Radio
- Remote start signal to the Radio
- Heated steering wheel power feed to the SCCM

HEATED STEERING WHEEL

HEATED STEERING WHEEL

Refer to [COMPONENT INDEX](#).

The heated steering wheel contains a heating element in the steering wheel. Power to the heated steering wheel heating elements are provided using hardwired signals from the SCCM, via the steering wheel switch. The heated steering wheel contains a Negative Temperature Coefficient (NTC) type of thermistor. The thermistor is used for temperature sensing of the heated steering wheel element. The heated steering wheel provides thermistor feedback to the steering wheel switch using hardwired signals.

INTEGRATED CENTER STACK (ICS) MODULE

INTEGRATED CENTER STACK (ICS) MODULE

Refer to [COMPONENT INDEX](#).

The ICS can a monetary non latching hard button for the heated steering wheel activation or deactivation. This switch has two states, pressed and not pressed. The ICS is placed on the CAN-IHS bus for communication with the CSWM.

Inputs

- Internal ON/OFF input from the hard button heated steering wheel switch located on the ICS
- Heated steering wheel status signals from the CSWM

Outputs

- CAN-IHS messages containing the hard button heated steering wheel switch ON/OFF requests to the CSWM
- Internal output to the hard button heated steering wheel switch for LED illumination strategy

RADIO

RADIO

Refer to [COMPONENT INDEX](#).

Certain radios allow for a climate control touch screen menu that includes a heated steering wheel soft button. When this button is pressed, a CAN-IHS signal is sent to the CSWM for the selected heated steering wheel operation.

The Radio also contains the customer programmable Drive Comfort System Feature menu options that includes heated seat and wheel operation under engine start events.

Inputs

- Remote start/normal start signal from the CSWM
- Remote start signal from the CSWM
- Heated steering wheel status signals from the CSWM
- Configuration data from the BCM

Outputs

- Soft button heated steering wheel switch ON/OFF requests to the CSWM

STEERING COLUMN CONTROL MODULE WITH STEERING WHEEL SWITCH

STEERING COLUMN CONTROL MODULE WITH STEERING WHEEL SWITCH

Refer to [COMPONENT INDEX](#).

For heating the steering wheel, the SCCM provides power and return to the steering wheel heating element using hardwired signals. The steering wheel switch monitors the heated steering wheel temperature through hardwired circuits connected to a thermistor. The thermistor is what detects the temperature of the heated steering wheel. The steering wheel switch, via the SCCM, reports the heated steering wheel temperature on a signal sent over the Local Interface Network (LIN) bus. The steering wheel switch is also used to detect and report faults, via the SCCM, in the thermistor.

Inputs

- Heated steering wheel command signal from the CSWM
- Internal heated steering wheel return signal from the heated steering wheel
- Internal steering wheel temperature sense signal from the steering wheel switch to the heated steering wheel

Outputs

- Heated steering wheel return feed to the CSWM
- Internal output for the steering wheel heater command to the heated steering wheel
- Internal heated steering wheel temperature return signal to the steering wheel switch
- Steering wheel temperature sensor and steering wheel temperature from the steering wheel switch to the BCM

DIAGNOSIS AND TESTING

HEATED STEERING WHEEL

- NOTE:** Vehicles equipped with the heated steering wheel option utilize a low voltage cut-off feature. This feature turns off power to the heated steering wheel anytime vehicle voltage is below 9.0 volts or above 16.0 volts. Be certain to check the vehicle electrical system for proper voltage anytime the heated steering wheel appears inoperative.
- NOTE:** If a Diagnostic Trouble Code (DTC) can not be verified, it is a good indication that an INTERMITTENT fault condition may be present. To help find an intermittent problem, move the steering wheel around while testing continuity. Also wiggle the heated steering wheel wire harness and electrical connectors while testing continuity.
- NOTE:** For complete circuit diagrams, see Wiring Information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .
- NOTE:** The Auto On feature is designed to function at an ambient temperature of 4B°C (40B°F) or below. Make sure this option is enabled in the customer programmable interface prior to diagnosis of an inoperative Auto On feature concern.

Before testing any individual components in the heated steering wheel system, check the following:

- Check the ignition fuse in the Power Distribution Center (PDC). Repair as necessary.
- Using a scan tool, check for any Diagnostic Trouble Codes (DTCs) related to the Heated Seat Module (HSM) and the U-Connect Touch TM screen module. If any DTCs are found, repair as necessary.

- Check the vehicle's battery open-circuit voltage and charging system performance. If the vehicle's electrical system is defective or weak it may not be supplying sufficient energy to operate the heated steering wheel system.
- If there are no DTCs and the heated steering wheel system functions properly, but the heated steering wheel indicator does not illuminate, the Integrated Center Stack (ICS) Module must be replaced.

Vehicle	Wheel Type	Heat Element Resistance Ω B $\pm$ 10% @ 23B°C
JL/JT/J9/Mojave	All leather	1.45
RU/RU-PHEV	All Premium Wrap	1.45

Heated steering wheel element resistance: Heat Element Resistance Ω B $\pm$ 10% @ 23B°C is 1.45

TEMPERATURE SENSOR RESISTANCE				
B°C	B°F	Nominal (Ohms)	Minimum (Ohms)	Maximum (Ohms)
0	32	32650	30601	34699
5	41	25388	23861	26914
10	50	19900	18754	21046
15	59	15708	14842	16574
20	68	12490	11831	13149
25	77	10000	9500	10500
30	86	8057	7632	8482
35	95	6531	6173	6889
40	104	5327	5024	5630
45	113	4369	4111	4626
50	122	3603	3384	3822
55	131	2986	2799	3174
60	140	2488	2327	2649
65	149	2083	1945	2221
70	158	1752	1633	1871
75	167	1481	1378	1585
80	176	1258	1168	1348
85	185	1072	994.2	1151
90	194	917.7	849.4	986.0
95	203	788.5	728.6	848.4
100	212	680.0	627.4	732.6

SWITCH, HEATED STEERING WHEEL

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

WARNING:

Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions may result in accidental airbag deployment and possible serious or fatal injury.

The heated steering wheel switch is located in the Integrated Center Stack (ICS) module. The ICS cannot be adjusted or repaired. If the heated steering wheel switch or indicator lamp is inoperative or damaged, the entire

ICS must be replaced. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), EMOVAL AND INSTALLATION** .

WHEEL, HEATED STEERING

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The steering wheel heating element is not serviced separately from the steering wheel. If the steering wheel heating element is ineffective or inoperative, then the steering wheel must be replaced. For steering wheel replacement. Refer to **WHEEL, STEERING, EMOVAL AND INSTALLATION** .

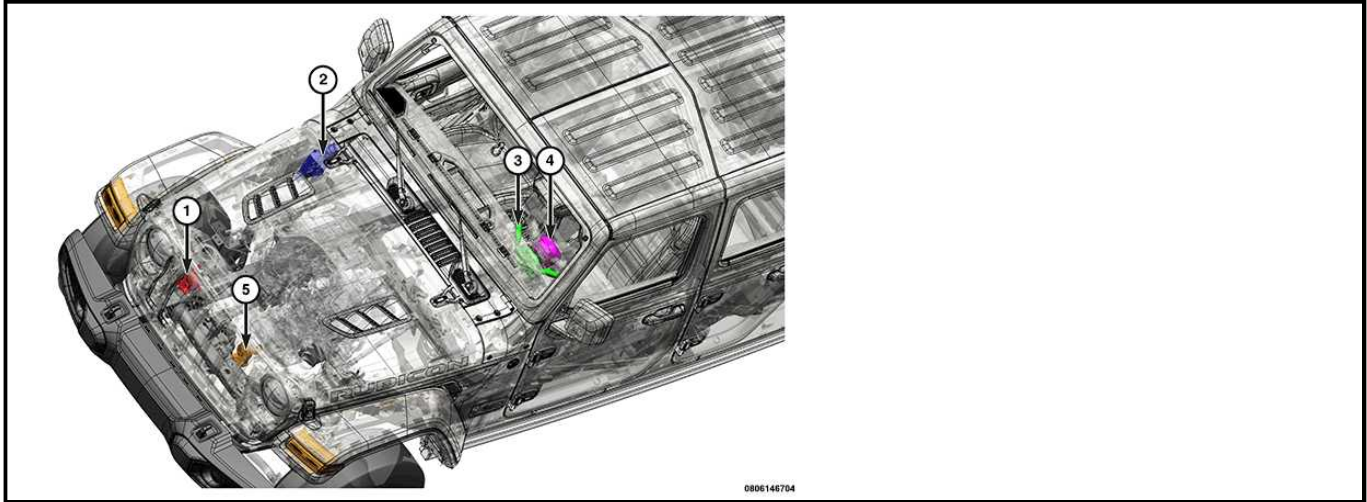
2021 ACCESSORIES AND BODY, CAB

Horn System (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The horn system includes the following major components:

COMPONENT INDEX

1.	Refer to <u>HORNS</u> - High Tone.
2.	Refer to <u>BODY CONTROL MODULE (BCM)</u> .
3.	Refer to <u>STEERING COLUMN CONTROL MODULE (SCCM)</u> .
4.	Refer to <u>HORN SWITCH</u> .
5.	Refer to <u>HORNS</u> - Low Tone.

An electrically-operated dual-note horn system is standard factory-installed equipment in this vehicle. The horn system features individual low-note and high-note horn units. The Power Distribution Center (PDC) contains the horn fuse and the horn relay. Pressing either side of the upper surface of the Driver AirBag (DAB) trim cover in the center of the steering wheel actuates the horn switch contacts, which provides the vehicle operator with a convenient, audible signaling device that can be used to alert pedestrians or the operators of other vehicles in close proximity.

OPERATION

The horn operates on battery current received through a fuse, located in the PDC, that is fed through a horn relay located in the PDC, which is soldered to a printed circuit board. The vehicle operator can control typical horn system signaling through the horn switch within the hub of the steering wheel. When the upper surface of the DAB trim cover is pressed, it provides a ground signal sense signal through the SCCM to the BCM. In response to that input, the BCM uses a High Side Driver (HSD) to provide a B(+) path to the coil of the horn relay in the PDC. The horn system circuit is designed so that the system will remain operational, regardless of the status of the ignition switch.

The horns can also be activated by the BCM to support each of the following features:

- **Remote Keyless Entry System** - Remote Keyless Entry (RKE) system **Lock** request audible verification.
- **Remote Keyless Entry System** - RKE system **Panic** mode audible alert for North America Free Trade Agreement (NAFTA) markets only.

- **Remote Start System** - Remote Start System **Start** request audible verification for NAFTA markets only.
- **Vehicle Theft Alarm** - Vehicle Theft Alarm (VTA) audible alarm except in vehicles manufactured for markets where an alarm siren is required.

The BCM can be programmed to enable or disable horn chirps for door lock and/or remote start requests. The operator has the option of configuring each or these settings in the BCM. Refer to the Owner service information for accessing these settings.

The hardwired circuits between components related to the horn system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the horn system or the electronic controls and communication between modules and other devices that provide some features of the horn system. The most reliable, efficient and accurate means to diagnose the horn system or the electronic controls and communication related to horn system operation requires the use of a diagnostic scan tool.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to COMPONENT INDEX .
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When the DAB trim cover is pressed, the closed horn switch circuit provides a ground signal sense to the SCCM, which then, using a HSD, pulls the control coil of the horn relay located within the PDC to battery voltage. The horn relay is continuously connected to ground. The horn relay then controls the output to the horns accordingly through a fuse in the PDC.

Inputs

- Horn request from horn switch
- Accessory blink request; FOBIK safe unlock all request
- Remote start chirp
- Panic request; FOBIK RF request
- IPC setup for horn sound during lock and remote start
- Alarm system horn request

Outputs

- Horn command to horn relay

NOTE: If the horn switch is activated for more than 30 seconds, the internal timer to the BCM will deactivate the horn for a 23 second cool down period. For all other horn request functions, the timer in the BCM will not effect the horn activation function.

HORNS

HORNS

Refer to COMPONENT INDEX .
--

The horns have a path to ground at all times through the wire harness connection to an eyelet terminal secured to the body sheet metal. The horns are completely controlled by a fused B(+) output received through a fuse and the closed contacts of the horn relay located within the PDC.

Within the two halves of the horn housing are a flexible diaphragm, a plunger, an electromagnetic coil and a set of contact points. The diaphragm is secured in suspension around its perimeter by the mating surfaces of the horn housing. The plunger is secured to the center of the diaphragm and extends into the center of the electromagnetic coil. The contact points control the current flow through the windings of the electromagnetic coil.

When the horns are energized, electrical current flows through the closed contact points to each electromagnetic coil. The resulting electromagnetic field draws each plunger and diaphragm toward it until that movement mechanically opens the contact points. When the contact points open, the electromagnetic field collapses allowing each plunger and diaphragm to return to their relaxed positions and closing the contact points again. This cycle continues repeating at a very rapid rate producing the vibration and movement of air that creates the sound that is directed through each horn trumpet outlet.

HORN SWITCH

HORN SWITCH

Refer to [COMPONENT INDEX](#).

The horn switch allows the vehicle operator to actuate the horns by pressing anywhere on the upper surface of the DAB trim cover in the center of the steering wheel. The three sets of horn switch contacts are wired in parallel so they perform as a single switch. One wire for each pair of contacts is connected to a path to ground at all times through the SCCM and the steering wheel wire harness.

STEERING COLUMN CONTROL MODULE (SCCM)

STEERING COLUMN CONTROL MODULE (SCCM)

Refer to [COMPONENT INDEX](#).

The SCCM provides the ground sense to the BCM when the horn switch is pressed. The horn switch acquires the ground sense through the SCCM ground circuit. The horn switch passes the ground sense through the steering wheel wire harness back to the SCCM, which in turn provides the ground sense to the BCM through the steering column wire harness.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HORN SYSTEM

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: A continuously sounding horn is immediately resolved by disconnecting the wire harness connector(s) at the horn(s).

HORN SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
HORN SOUNDS CONTINUOUSLY	1. Damaged or ineffective horn feed circuit.	1. Test and repair shorted horn feed circuit if required.
	2. Damaged or ineffective horn switch return circuit.	2. Test and repair shorted horn switch return circuit if required.

HORN SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Damaged or ineffective clockspring.	3. Test and replace the shorted clockspring and stalk unit (Steering Column Control Module/SCCM) if required.
	4. Damaged or ineffective horn switch.	4. Test and replace the shorted horn switch, if required.
	5. Damaged or ineffective horn relay.	5. Test the horn relay inputs and outputs of the Power Distribution Center (PDC). Replace the PDC if required.
	6. Ineffective Body Control Module (BCM) inputs or outputs.	6. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
HORN SOUNDS INTERMITTENTLY AS THE STEERING WHEEL IS ROTATED	1. Damaged or ineffective horn switch return circuit.	1. Test and repair intermittent shorted horn switch return circuit if required.
	2. Damaged or ineffective horn switch.	2. Test and replace the intermittent open or shorted horn switch, if required.
HORN DOES NOT SOUND	1. Damaged or ineffective horn ground circuit.	1. Test and repair open horn ground circuit if required.
	2. Damaged or ineffective horn feed circuit.	2. Test and repair open horn feed circuit if required.
	3. Damaged or ineffective horn.	3. Test and replace open horn if required.
	4. Damaged or ineffective horn switch feed circuit.	4. Test and repair open horn switch feed circuit if required.
	5. Damaged or ineffective horn switch return circuit.	5. Test and repair open horn switch return circuit if required.
	6. Damaged or ineffective clockspring.	6. Test and replace the open clockspring and stalk unit (SCCM) if required.
	7. Damaged or ineffective horn switch.	7. Test and replace the open horn switch, if required.
	8. Damaged or ineffective horn relay.	8. Test the horn relay inputs and outputs of the PDC. Replace the PDC if required.
	9. Ineffective BCM inputs or outputs.	9. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.

HORN

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HORN

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to **STANDARD PROCEDURE** . and. Refer to **REMOVAL** . Refer to **INSTALLATION** .

1. Disconnect the wire harness connector from the horn. Check for continuity between the horn ground circuit cavity of the harness connector and a good ground. There should be continuity. If OK, go to **Step 2** . If not OK, repair the open ground circuit to ground as required.
2. Check for battery voltage at the horn input circuit cavity of the harness connector. There should be zero volts. If OK, go to **Step 3** . If not OK, repair the shorted horn output circuit between the horn and the horn relay in the Power Distribution Center (PDC) as required.

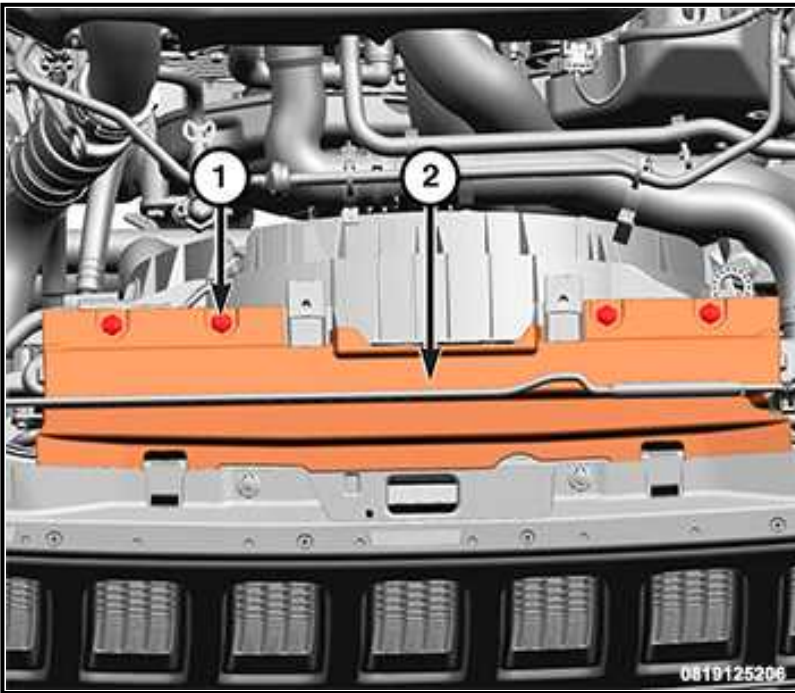
3. Press the horn switch. There should now be battery voltage at the horn input circuit cavity of the harness connector for the horn. If OK, replace the ineffective horn. If not OK, perform additional diagnosis of the horn switch, the clockspring, the horn switch input to the Body Control Module (BCM) and the BCM output to the horn relay in the PDC as required.

REMOVAL AND INSTALLATION

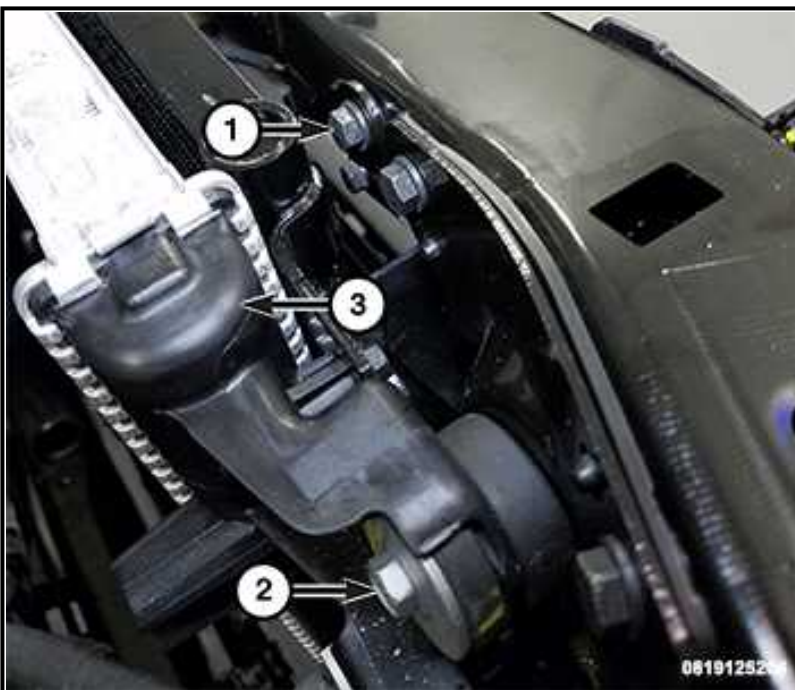
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .

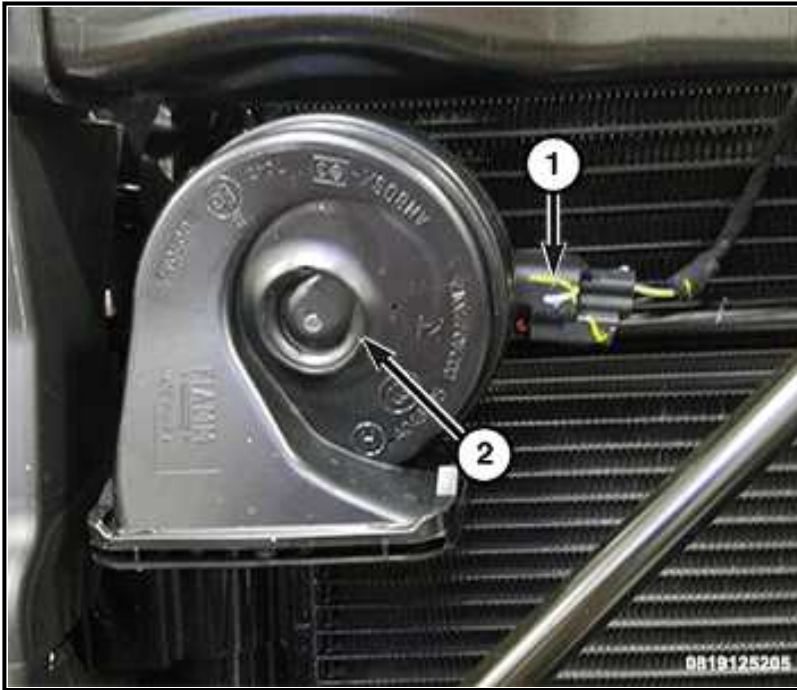


2. Remove the upper radiator trim panel retainers (1) and remove the upper radiator trim panel (2).



3. Remove the upper radiator to body mounting bolts (2) on both sides of the radiator and carefully rock the radiator (3) rearward.

4. Remove the horn mounting bracket to body mounting bolt (1) and leave the tab engaged in the body structure.
5. Remove the grille. Refer to [**GRILLE, REMOVAL AND INSTALLATION**](#) .



6. Disconnect the horn wire harness connector (1).
7. Remove the horn with bracket (2) from the vehicle.

INSTALLATION

1. Position the horn to the vehicle and engage the tab in the body structure.
2. Connect the horn wire harness connector.
3. Install the grille. Refer to [**GRILLE, REMOVAL AND INSTALLATION**](#) .
4. Install the horn mounting bracket to body structure mounting bolt and tighten securely.
5. Reposition the radiator, install the radiator to body structure mounting bolts and tighten to the proper (Torque Specification).
6. Position the upper radiator trim panel and install the push pin retainers.
7. Connect the negative battery cable(s). Refer to the appropriate service information .

SWITCH, HORN

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HORN SWITCH

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness

connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to **STANDARD PROCEDURE** . and. Refer to **REMOVAL** . Refer to **INSTALLATION** .

1. Remove the Driver Air Bag (DAB) from the steering wheel. Refer to **AIR BAG, DRIVER, REMOVAL AND INSTALLATION** .
2. Disconnect the steering wheel wire harness connector from the horn switch connector.
3. With the horn switch contacts released, check for continuity between the two terminals in the horn switch connector. There should be no continuity. If OK, go to **Step 4** . If not OK, replace the DAB.
4. With each of the horn switch contacts pressed one at a time, check for continuity between the two terminals in the horn switch connector. There should now be continuity. If OK, go to **Step 5** . If not OK, replace the DAB.
5. Check the ground circuit between the horn switch and Steering Column Control Module (SCCM) for continuity. If OK, go to **Step 6** . If not OK, repair the open ground circuit or replace the SCCM as required.
6. Check the internal ground circuit of the SCCM for continuity to ground from the horn switch connector receptacle on the SCCM to chassis ground. If OK, go to **Step 8** . If not OK, go to **Step 7** .
7. Check the SCCM ground circuit to chassis ground for continuity from the SCCM connector to chassis ground. If OK, replace the SCCM. If not OK, repair the SCCM ground circuit for an open.
8. Check the horn switch sense circuit between the SCCM and the Body Control Module (BCM) for shorts or opens. Repair the shorted or open circuit.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The horn switch is integral to the Driver Air Bag (DAB). The horn switch cannot be adjusted or repaired. If the horn switch becomes inoperative or damaged, the entire DAB must be replaced. Refer to **AIR BAG, DRIVER, REMOVAL AND INSTALLATION** .

2021 ACCESSORIES AND EQUIPMENT

(Instrument Cluster - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1612-00</u>	PANEL ILLUMINATION CONTROL
<u>B21DD-84</u>	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
<u>B21DD-85</u>	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
<u>B2213-00</u>	CABIN COMPARTMENT NODE/CLUSTER INTERNAL
<u>B275B-00</u>	AIRBAG TELLTALE
<u>U0001-00</u>	CAN C BUS
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0102-00</u>	LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE/AWD
<u>U0104-00</u>	LOST COMMUNICATION WITH CRUISE CONTROL MODULE
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"
<u>U0127-00</u>	LOST COMMUNICATION WITH TIRE PRESSURE MONITOR MODULE
<u>U0131-00</u>	LOST COMMUNICATION WITH POWER STEERING CONTROL MODULE "A"
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0151-00</u>	LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)
<u>U0159-00</u>	LOST COMMUNICATION WITH PARK ASSIST CONTROL MODULE
<u>U0212-00</u>	LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE
<u>U0405-00</u>	INVALID DATA RECEIVED FROM CRUISE CONTROL MODULE
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0452-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RESTRAINTS CONTROL MODULE
<u>U1159-00</u>	LOST COMMUNICATION WITH AUTOMATIC SWAY BAR SYSTEM
<u>U11B9-00</u>	LOST COMMUNICATION WITH RF HUB
<u>U11FB-00</u>	LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR
<u>U121A-00</u>	LOST COMMUNICATION WITH COLLISION MITIGATION MODULE
<u>U1464-00</u>	IMPLAUSIBLE DATA RECEIVED FROM EPS STEERING TORQUE
<u>U1478-00</u>	IMPLAUSIBLE DATA RECEIVED FROM EMERGENCY ALERT MODULE
<u>U1485-00</u>	IMPLAUSIBLE DATA RECEIVED FROM AUTOMATIC SWAY BAR SYSTEM
<u>U1492-00</u>	IMPLAUSIBLE DATA RECEIVED FROM COLLISION MITIGATION MODULE

DIAGNOSIS AND TESTING

B1612-00-PANEL ILLUMINATION CONTROL

For a complete MESSAGE SYSTEMS wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

For an in depth explanation of the Instrument Panel Cluster (IPC) system. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Continuously with the ignition on.
- System voltage between 9.0 and 16.0 volts.

SET CONDITION

- Output current is greater than 5A for more than 300 ms.

DEFAULT ACTION

- Loss of dimming or dimming control.

POSSIBLE CAUSES

Possible Causes
DIMMER CONTROL CIRCUIT DTCS PRESENT IN THE BODY CONTROL MODULE (BCM)
FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
PANEL LAMPS DRIVER CIRCUIT OPEN OR HIGH RESISTANCE
HEADLAMP DIMMER SWITCH
INSTRUMENT PANEL CLUSTER (IPC)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FREQUENCY COUNTER (FC) AND IGNITION CYCLE (IC) COUNTER VALUES IN ENVIRONMENTAL DATA

1. Using the scan tool, check the Environmental Data Frequency counter (FC) and Ignition Cycle (IC) counter values.

Review the following statements and select the appropriate choice:

The Frequency counter (FC) is equal to 1 and the Ignition Cycle (IC) counter is equal to 0.

- Go To [3](#)

The Frequency counter (FC) is greater than 1 and the Ignition Cycle (IC) counter is equal to 0.

- Go To [9](#)

3. CHECK FREQUENCY COUNTER (FC) AND IGNITION CYCLE (IC) COUNTER VALUES IN ENVIRONMENTAL DATA AFTER PERFORMING 10 SLEEP CYCLES

1. Perform at least 10 Sleep Cycles (turn the ignition off until the bus is inactive, then turn the ignition on).
2. Using the scan tool, check the Environmental Data Frequency counter (FC) and Ignition Cycle (IC) counter values.

Review the following statements and select the appropriate choice:

The Frequency counter (FC) is equal to 1 and the Ignition Cycle (IC) counter is equal to 0.

- Go To [4](#)

The Frequency counter (FC) is equal to or greater than 1 and the Ignition Cycle (IC) counter is equal to or greater than 1.

- Go To [9](#)

4. CHECK FOR RELATED DTCS IN THE BODY CONTROL MODULE (BCM)

1. Refer to the saved DTC information recorded on the repair order.

Were any Instrument Panel Illumination related DTCs set in the BCM?

Yes

- Repair the BCM DTC(s). Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [5](#)

5. CHECK THE (A108) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

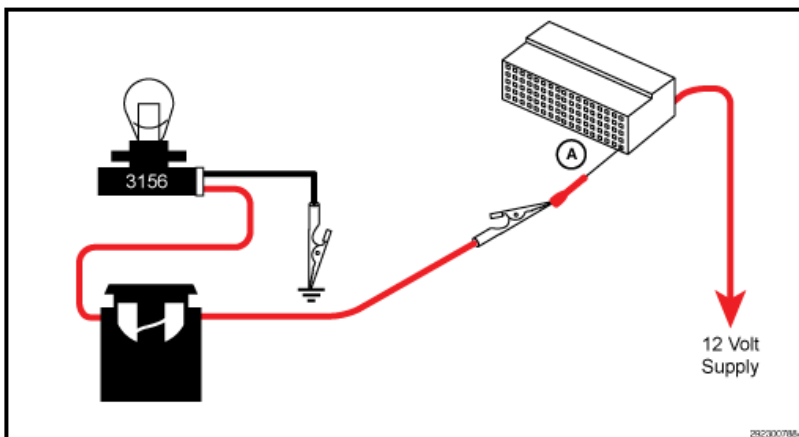
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

6. CHECK INTERIOR LIGHTS WHILE ADJUSTING THE DIMMER SWITCH BETWEEN LOW AND HIGH

1. While monitoring all lights on the dimmer circuit, adjust the dimmer switch between low and high.

NOTE: Depending on the vehicle options, this can include the cup holder, fuel door switch, media port and center console lamps.

Do the interior lights on the dimmer circuit change appropriately while adjusting the dimmer switch?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. ISOLATE AND CHECK THE (E12) PANEL LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BETWEEN THE INSTRUMENT PANEL CLUSTER (IPC) AND THE HEADLAMP SWITCH

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Repair the circuit for an open or high resistance.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

8. ISOLATE AND CHECK THE (E12) PANEL LAMP DRIVER CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BETWEEN THE INSTRUMENT PANEL CLUSTER (IPC) AND THE HEADLAMP SWITCH IN ORDER TO VERIFY DIMMER SWITCH FUNCTIONALITY

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Replace the Headlamp Dimmer Switch in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all IPC harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.
 - Check fuse and replace if open.

Repair any conditions that are found.

6. Reconnect all IPC harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read IPC DTCs.

Did the DTC return?

Yes

- Replace the Instrument Panel Cluster (IPC) in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete MESSAGE SYSTEMS wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

For an in depth explanation of the Instrument Panel Cluster (IPC) system. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Continuously with the ignition on.

SET CONDITION

- The voltage value that the module receives over the CAN Bus from the BCM is below 10.0 volts for more than 15 seconds.

DEFAULT ACTION

- None.

POSSIBLE CAUSES

Possible Causes
SYSTEM VOLTAGE LOW BATTERY OR CHARGING SYSTEM

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

CHECK POWERTRAIN CONTROL MODULE (PCM) DTCS

1. With the scan tool, read PCM DTCs and record on the repair order.

Are there any PCM Charging or Battery DTCs present?

Yes

- Repair the PCM DTCs. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- This DTC is a CAN system message for information only.
- Check the 12 volt battery and charging system in accordance with the Service Information.

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete MESSAGE SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

For an in depth explanation of the Instrument Panel Cluster (IPC) system. Refer to [DESCRIPTION AND OPERATION](#) .

WHEN MONITORED

- Continuously with the ignition on.

SET CONDITION

- The voltage value that the module receives over the CAN Bus from the BCM is above 16.0 volts for more than 15 seconds.

DEFAULT ACTION

- None.

POSSIBLE CAUSES

Possible Causes
SYSTEM VOLTAGE HIGH BATTERY OR CHARGING SYSTEM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR POWERTRAIN CONTROL MODULE (PCM) RELATED DTCS

1. With the scan tool, read Powertrain Control Module (PCM) DTCs and record on the repair order.

Are there any PCM charging or battery DTCs present?

Yes

- Repair the PCM DTCs. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- This DTC is a CAN system message for information only.
- Check the 12 volt battery and charging system in accordance with the Service Information.

B2213-00-CABIN COMPARTMENT NODE/CLUSTER INTERNAL

For a complete MESSAGE SYSTEMS wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

For an in depth explanation of the Instrument Panel Cluster (IPC) system. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Continuously with the ignition on.
- System voltage between 9.0 and 16.0 volts.

SET CONDITION

- The module detects an internal controller failure.

POSSIBLE CAUSES

Possible Causes
INSTRUMENT PANEL CLUSTER (IPC)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all IPC harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.

5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
- Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all IPC harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read IPC DTCs.

Did the DTC return?

Yes

- Replace the IPC in accordance with the Service Information. Refer to **MODULE, INSTRUMENT PANEL CLUSTER (IPC), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B275B-00-AIRBAG TELLTALE

For a complete MESSAGE SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

For an in depth explanation of the Instrument Panel Cluster (IPC) system. Refer to **DESCRIPTION AND OPERATION** .

WHEN MONITORED

- Continuously with the ignition on.
- System voltage between 9.0 and 16.0 volts.

SET CONDITION

- The module detects an open or short in the Airbag LED circuit internal to the controller.

DEFAULT ACTION

- Redundant airbag soft telltale and pop-up appears.

POSSIBLE CAUSES

Possible Causes
INSTRUMENT PANEL CLUSTER (IPC)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect all IPC harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all IPC harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read IPC DTCs.

Did the DTC return?

Yes

- The LED circuit for the Airbag is non-serviceable. Replace the Instrument Panel Cluster (IPC) in accordance with the Service Information. Refer to **REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

U0001-00-CAN C BUS

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX**.

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX**.

U0100-00-LOST COMMUNICATION WITH ECM/PCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE**.

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0102-00-LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE/AWD

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0104-00-LOST COMMUNICATION WITH CRUISE CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0127-00-LOST COMMUNICATION WITH TIRE PRESSURE MONITOR MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0131-00-LOST COMMUNICATION WITH POWER STEERING CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0151-00-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0159-00-LOST COMMUNICATION WITH PARK ASSIST CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0212-00-LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0405-00-INVALID DATA RECEIVED FROM CRUISE CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0452-00-IMPLAUSIBLE DATA RECEIVED FROM RESTRAINTS CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1159-00-LOST COMMUNICATION WITH AUTOMATIC SWAY BAR SYSTEM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11B9-00-LOST COMMUNICATION WITH RF HUB

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11FB-00-LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U121A-00-LOST COMMUNICATION WITH COLLISION MITIGATION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

NOTE: The Collision Mitigation Module (CMM) is also referred to as the Adaptive Cruise Control (ACC) module or the Driver Assistance System Module (DASM).

U1464-00-IMPLAUSIBLE DATA RECEIVED FROM EPS STEERING TORQUE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1478-00-IMPLAUSIBLE DATA RECEIVED FROM EMERGENCY ALERT MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1485-00-IMPLAUSIBLE DATA RECEIVED FROM AUTOMATIC SWAY BAR SYSTEM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1492-00-IMPLAUSIBLE DATA RECEIVED FROM COLLISION MITIGATION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

NOTE: The Collision Mitigation Module (CMM) is also referred to as the Adaptive Cruise Control (ACC) module or the Driver Assistance System Module (DASM).

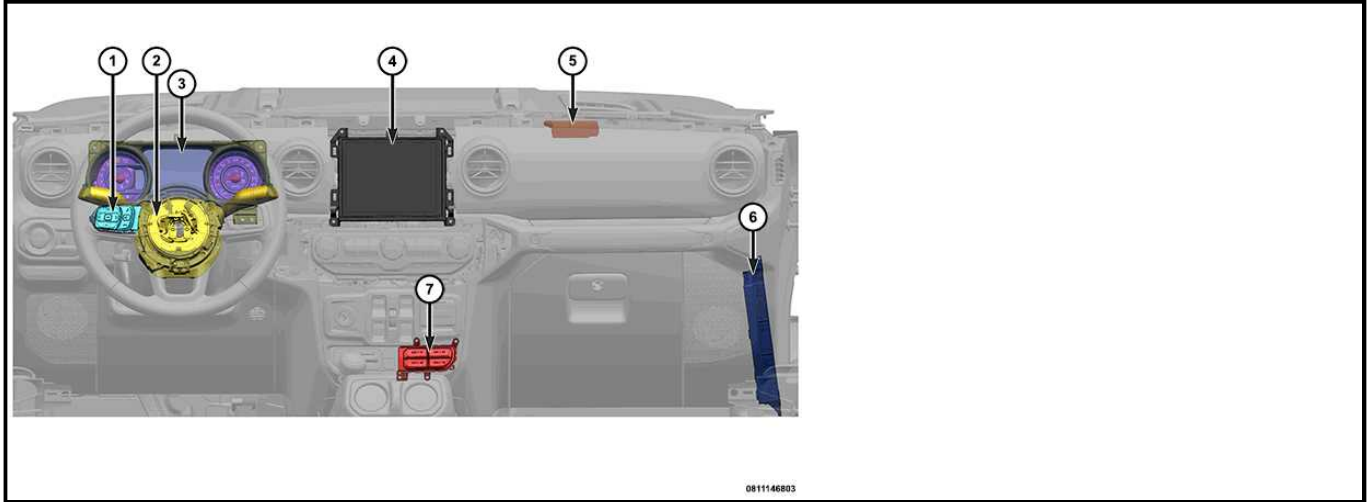
2021 ACCESSORIES AND EQUIPMENT

Instrument Cluster - Service Information - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The IPC system can be comprised of several different components. Those components are:

COMPONENT INDEX

1.	Refer to <u>ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH.</u>
2.	Refer to <u>STEERING COLUMN CONTROL MODULE (SCCM)</u> with Steering Wheel Switch.
3.	Refer to <u>INSTRUMENT PANEL CLUSTER (IPC).</u>
4.	Refer to <u>RADIO.</u>
5.	Refer to <u>REMOTE COMPASS MODULE.</u>
6.	Refer to <u>BODY CONTROL MODULE (BCM).</u>
7.	Refer to <u>AUXILIARY SWITCH BANK.</u>

OPERATION

The IPC for this vehicle is located in the instrument panel above the steering column opening. The IPC gauges and indicators are visible through an opening in the cluster bezel and are protected by a clear plastic cluster lens that is secured to the cluster housing by integral latch formations.

Each of the cluster hard indicators as well as the general cluster illumination is provided by dedicated Light Emitting Diode (LED) units soldered to the cluster electronic circuit board.

Several versions of the IPC are offered on this vehicle. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle is offered. The IPC utilizes integrated circuitry and information carried on both the Controller Area Network - Chassis (CAN-C) data bus networks along with several hard wired inputs to monitor other sensors and switches in the vehicle. In response to those inputs, the internal circuitry and programming of the IPC allow it to monitor many electronic functions and features of the vehicle.

The IPC contains 4 analog gauges for mid-line IPC (3.5 inch EVIC) and 2 analog gauges for the high-line IPC (7 inch color EVIC) and has provisions for up to 24 International Control and Display Symbol icon indicators that are all controlled by the IPC and standard on all models. The IPC lens and the IPC hood and mask unit are the only components of the IPC assembly that can be serviced separately.

The mid-line IPC (3.5 inch EVIC) includes the following analog gauges:

- **Engine Temperature Gauge**
- **Fuel Gauge**
- **Speedometer**
- **Tachometer**

The high-line IPC (7 inch color EVIC) includes following analog gauges:

- **Engine Temperature Gauge**
- **Speedometer**

For more information on the International Control and Display Symbol icons. Refer to [**INTERNATIONAL VEHICLE CONTROL AND DISPLAY SYMBOLS, DESCRIPTION**](#) .

SPEEDOMETER OPERATION - The purpose of the speedometer feature is to accurately inform the driver of the vehicle speed. The speedometers are biased high to meet the certain country accuracy requirements. However, the indicated speed will not exceed the maximum tolerance limitation from the countries where the vehicle is sold.

The IPC receives a CAN-C vehicle speed message from the ABS module. The IPC will then transmit the speedometer value, by use of an internal signal, to the IPC display screen.

ODOMETER OPERATION - The total odometer value is the total accumulated distance covered by the vehicle. Total odometer values increment every 1 kilometer and can not be reset. The IPC contains an odometer line arbitrator routine that checks various parameters before allowing the odometer to be updated. Once the IPC has retrieved the odometer information from memory, the odometer line arbitrator initiates writing information to the odometer line. If any warnings, faults or bus errors are detected, the IPC will display fault messages. If there are no warning or faults, the arbitrator will write to the odometer display.

The IPC receives left and right wheel speed sensor pulse values over the CAN-C bus. The IPC calculates the related travel distance of the vehicle as an average of the rear wheel counters, increments the total odometer value, and transmits this value on the CAN-C bus. This signal is then gated by the BCM and broadcast on the CAN-IHS bus.

TACHOMETER OPERATION - The Powertrain Control Module (PCM) sends an engine RPM message over the CAN-C bus to the IPC which contains the value for the IPC to filter and decode in order to drive the pointer.

FUEL GAUGE OPERATION - The fuel level feature is only active when the ignition is in the RUN or START position. The BCM will broadcast a CAN-C fuel voltage message which represents a valid fuel level read from the fuel sensor. This signal is acquired by the IPC, accumulated and averaged once per second. The averaged fuel voltage is then filtered and converted to a desired fuel voltage. This fuel voltage ends up being the value that the IPC uses to indicate the amount of fuel for the fuel gauge.

The IPC is able to determine the fuel tank type by another CAN-C message from the BCM with the configuration data. The IPC also will read, from the BCM, the fuel type, the wheel base and the rated fuel tank capacity. These parameters determine a unique fuel tank type to select the desired fuel array, which is an internal IPC logic, for the IPC to chose from when deciding the fuel level. Essentially, the fuel gauge output, or fuel level indicator, is determined by a ratio of total fuel volume and rated fuel tank capacity.

IPC Bottom Learn Strategy - The IPC learns the bottom of the fuel tank. The bottom learning algorithm is active after the engine is running and battery voltage is greater than 10.9 v. The bottom learn value is the fuel voltage that corresponds to the lowest readable fuel volume. It is initialized to the maximum bottom learn value and dynamically learns down to the physical bottom of the fuel tank or to the minimum learn value, whichever is higher. Dynamic bottom learn compensates for variations in fuel tank builds as well as deformations due to temperature and loading. This allows for a proper fuel gauge reading to the customer.

Low Fuel Detection - The IPC determines the low fuel threshold by using a distance to empty algorithm and the average fuel volume, or level. When the distance to empty is below 48 km (30 miles) and the average fuel volume is less than the low fuel threshold (which is defined as a 1/4 indication of the fuel gauge), the low fuel level status will be set to true and transmitted on the CAN-C signal. The low fuel level warning telltale will be turned on associated with a single warning chime and the "Fuel Low" text warning message will then display for five seconds on the IPC.

Loose Gas Cap Indication - The PCM transmits the indication of a loose fuel cap via the CAN bus to the IPC. The PCM estimates, using internal logics, a possible fuel cap loose condition. If the PCM detects a loose cap, the PCM sends a CAN-C bus signal to the IPC. The IPC manages this signal to inform the driver that there is a possible loose gas cap. When the PCM indicators indicate that the gas cap is now fastened, the indicator will no longer be sent by the PCM.

AUDIO AND VIDEO INDICATIONS ON THE IPC:

IPC Displays for radio data

The IPC allocates a region of its display to show audio and telematics information such as audio and phone call status information. The radio sends the translated text strings (in all supported languages) to the IPC display via a CAN bus message for both audio and phone media. When the IPC receives this information, the IPC begins a buffering process to receive the data string message from the radio. Once the radio is finished sending the display text message, the IPC blanks the existing display text and begins to display the next text.

The data for audio that is being sent to the IPC is duplicated from what is being presented to the customer on the radio display screen. Some of these items are current radio station, data during tuning, fast forward, seek and other common display items. The IPC manages the duplicated data display on the IPC display once it is received. This includes all forms of radio audio media and inputs to the radio such as Auxiliary, Bluetooth or Universal Serial Bus (USB).

IPC displays for phone call data

The radio populates a phone menu setting for displaying phone information on the IPC and will allow sending of the phone information to the IPC only if this feature is configured to be enabled. Once this feature is configured to be enabled, the radio has a phone menu setting for showing/not showing phone information in the IPC and it is selectable by the customer where a customer has the ability to turn ON or OFF displaying the phone information in the IPC. After the customer selects to show the phone information in the IPC, the IPC uses an area of its display to show the phone information using either an incoming call pop-up or the information will be in the same place as the audio information.

The IPC display has two types of icons: incoming call and other calls. This feature is only supported by radios that are actively showing the phone information on the radio display (Paired phones, active call, etc.). If there is an active call and a second incoming call comes in, the radio will send the required messages for an incoming call where the IPC clears the data for the active call and shows the pop up for the latest incoming call. If the user accepts the call, then the radio sends the required messages to the IPC to clear the incoming call pop up. The radio then sends messages for the latest active call status to where the IPC display shows the information in the audio screen and updates it to the latest active call information. If the user ignores the call, then the radio sends required messages to the IPC to clear the incoming call pop up. The radio then sends messages for previous active call status where the IPC display shows call information in the audio screen and updates to the previous active call status information.

Phone call information takes priority over the music mute feature for the IPC display.

If the phone menu option is not set to active in the radio for the IPC display, the incoming call popup is based on a CAN signal. The IPC displays incoming call pop-ups only when the option is set to active. The IPC always displays incoming call information independent of the radio phone menu setting for phone information in Audio menu. When the IPC receives a gated popup active message over the CAN bus, it will display incoming call text status, the callers name (if available) and the phone number. The incoming call remains on the screen until cleared by IPC logic (based on IPC display priorities), or the call is ignored, answered, or the call is ended. If radio has determined that a call is ignored, answered, or the call is ended, the radio sends a gated

message to the IPC indicating that the popup is not active. The IPC will not show the incoming call if the popup is not active.

If an incoming call pop-up was cleared by IPC, the IPC will show the phone information with corresponding other call icons. In this case, the IPC will not show pop-up information again until the next incoming call.

The BCM performs gateway services for multiple signals when any signal value changes to support this feature.

IPC Displays for the Navigation Screen

The radio sends periodic and spontaneous information in all supported languages to the IPC to display. After the customer selects, by use of the radio settings menu, to turn on the navigation turn by turn in the IPC, the IPC will use an area of the display to show the turn arrow, distance to the next turn, units, speed limits, and the name of the next turn destination or street name. The IPC uses a signal to populate the display for turn by turn navigation pop up information.

The BCM gates several messages from radio CAN-IHS to CAN-C and then sends these CAN-C messages to the IPC for display.

EVIC DISPLAYS AND MENUS

- Tire Pressure Monitoring (TPM) Status - The TPM system monitors the pressure of each of the four active road tires and warns the driver, when either a low tire pressure condition or a TPM system malfunctions exists, through the IPC. The Base TPM system only uses the TPM telltale, audible chime and non-positional text messages to indicate low pressure or system fault conditions. Along with using the TPM telltale and audible chime, The Premium TPM system uses a configurable vehicle information display to display the actual tire pressure values or dashes for each of the four active road tires in the correct vehicle position. Various text messages, as required, will also be displayed in the configurable vehicle information display. The IPC receives these messages from the TPM module. The IPC receives CAN bus configuration messages from the BCM to determine the type of TPM system installed on the vehicle, the placard pressure values, and other vehicle configuration data to support the TPM display messages on the IPC.
- Percent Oil Life Gauge
 - The IPC acquires oil life data from the PCM over the CAN-C bus to manage the oil life display to the customer. The PCM manages the oil life algorithm based on several coefficients:
 - Engine RPM
 - Engine oil temperature
 - Engine load
 - Percent content of ethanol in the fuel for gasoline engines

The PCM monitors a CAN-C signal that indicates the miles traveled. When the PCM detects fuel is being delivered to the engine, the PCM calculates engine run time for oil life. With these signals being monitored, the PCM sends a CAN-C message for current oil percentage left, miles since last oil change, engine hours and calculated engine revolutions that have accumulated since the last oil life reset as determined by the PCM managed algorithm. Once the PCM reaches a calibrated threshold of about 5% for oil life left, the PCM sends a CAN-C bus message indicator of "Change Oil Soon" indicating that the time is near for an oil change. Once the percentage reaches 0%, the PCM then emits the CAN-C signal for "Change Oil Required", thus alerting the customer that the time is now for an oil change.

When an engine oil change is completed, it is necessary to communicate this to the PCM to allow it to reset its algorithm. The reset via EVIC allows the oil change algorithm to be reset. Under key-ON and engine not running conditions, upon selection and acknowledgment of the reset menu item, the IPC will send a CAN-C signal to the PCM. Upon receipt of this message by the PCM, the algorithm will reset the oil left and respond back to the IPC via CAN-C with a message indicating a successful reset.

The IPC manages the indicator to the driver about oil life based on the CAN-C oil life values sent to it by the PCM.

In the event of PCM failure that requires replacement, the diagnostic scan tool can be used to restore oil life values to ensure powertrain protection. The PCM sends out critical oil life data via CAN-C to the BCM. The BCM will monitor and retain the oil life data it receives from the CAN signals. This information is used by the diagnostic scan tool to interrogate the BCM before PCM replacement, and restore oil life algorithm to its current values after PCM replacement. If for any reason the diagnostic scan tool is unable to receive valid oil life values, the diagnostic scan tool will send a command to reset the oil life algorithm to severe duty. The severe duty reset limits the current oil life cycle to 6437 km (4000 miles) or less.

- **Oil Pressure Gauge** - The oil pressure gauge is a virtual graphic gauge with pointer/bar indicator in the IPC display screen. The IPC uses an oil pressure CAN signal to drive the gauge. During an ESS event, the oil pressure value will be displayed as dashes until the ESS event is complete. For oil pressure warning indication, a request signal is received by the IPC to illuminate or extinguish the gauge. Oil pressure signals are received from the oil pressure sensor by way of the PCM over the CAN-C bus.
- **Oil Temperature Gauge** - The oil pressure gauge is a virtual graphic gauge with pointer/bar indicator in the IPC display screen. The IPC uses an oil temperature CAN signal to drive the gauge. For oil temperature warning indication, a request signal is received by the IPC to illuminate or extinguish the gauge. All of the oil temperature signals are received from the oil pressure sensor by way of the PCM over the CAN-C bus.
- **Coolant Temperature Gauge** - The engine coolant temperature gauge could be a physical analog gauge with a pointer indication, and/or a virtual graphic gauge with pointer/bar indication in the cluster driver information display screen. The IPC filters and decodes a CAN-C coolant temperature input from the PCM to display the coolant temperature value on the IPC display screen. If the coolant temperature value is greater than a calibrated normal value, the IPC will display either a "Engine Water Over Temp" message or a "Engine Water Critical Temp" message to the driver of the vehicle. The default value to turn on the warning telltale is 125 B°C (257 B°F) for the 3.6L engine. The IPC will also activate a slow continuous warning chime once the temperature reaches 128 B°C (262 B°F)
- **Transmission Temperature Gauge** - The transmission temperature submenu is only shown in the IPC if the vehicle is equipped with an automatic transmission and if the automatic transmission is a ZF 8Spd. When equipped, the Transmission Control Module (TCM) transmits a CAN-C signal to the IPC to indicate the transmission oil temperature. The IPC filters, decodes and continues to monitor this signal and use this signal to display a virtual transmission oil temperature gauge, and as required, a transmission oil temperature warning.
- **Battery Voltage Gauge** - The BCM acquires the battery voltage directly from the battery by way of the Intelligent Battery Sensor (IBS). The BCM then sends this value in a signal on the CAN-C network to the IPC for the IPC display.

- The "Drivetrain" submenu gives addition information about the front wheel angle value, sway-bar status, transfer case lock status, axle locker status, pitch angle value and roll angle value on vehicles equipped with a premium level IPC. The IPC receives CAN bus messages from the following devices:

- The Drivetrain Control Module (DTCM) sends CAN messages indicating the type of transfer case equipped and the state of both front and rear axle lockers.
- The SCCM sends CAN messages indicating the steering angle value. The steering wheel angle display has a maximum of 40 degrees to the left and right of zero. This involves 20 images for angles to the left of zero and 20 images for angles to the right of zero. The IPC displays one image for every two degrees from zero angle. Zero angle has one image which denotes the wheels pointing straight ahead.
- Auto Sway Bar System (ASBS) module sends CAN messages indicating the sway bar status
- The BCM sends CAN messages indicating the pitch and roll angle values. In the event that the trail speed exceeds the actual vehicle speed signal from the ABS module, the IPC will not show or simply grey out all angle graphics and display a text message indicating that the pitch and roll are only available at trail speed followed by a km/h or mph value to be reached before the display will resume its normal operation. The default threshold of trail sped is 40 km/h (25 MPH).

FUEL ECONOMY MENU

The fuel economy screen displays the following information:

- Average fuel consumption - Average fuel economy is a ratio of the covered distance to the number of gallons consumed from the beginning of a trip. After the average fuel economy is calculated for every key ON event, the IPC will send the information out on the CAN bus.
- Instantaneous fuel consumption - When the ignition status is RUN or START, the instantaneous fuel economy is calculated as a function of a fuel used input and a distance traveled input, which is recalculated once every 100 milliseconds. Once the instantaneous fuel economy is calculated as a function of fuel used and distance traveled, the IPC will send the information out on the CAN bus.
- Distance to empty/range
 - Distance to empty displays the distance the vehicle can travel before the vehicles fuel is consumed. Distance to empty is calculated by using the following formula:
 - Distance to empty = Fuel Economy multiplied by the current fuel level. The fuel economy is calculated by using an average of the average fuel economy and the instantaneous fuel economy. The current fuel level is calculated from a fuel voltage signal and the fuel capacity signal. If a low fuel signal becomes active, a message will appear above the distance to empty value indicating low fuel. The distance to empty value will be calculated and displayed until it reaches less than 10 miles. Once this has been achieved, the distance to empty will not display again until the distance to empty value increases to above 45 miles.

The IPC will then broadcast the distance to empty value once calculated.

The BCM will broadcast the average and instantaneous fuel economy on the CAN-IHS bus. Average fuel consumption can be reset by the customer, however distance to empty and instantaneous fuel consumption can not be reset. Any reset of the fuel economy information will not affect the fuel economy seen in the trip displays as they are completely independent of one another.

TRIP MENU

- Trip A Submenu - Trip A elapsed time, distance, and average fuel economy values are displayed in this menu.
- Trip B Submenu - Trip B elapsed time, distance, and average fuel economy values are displayed in this menu.

ENGINE STOP START (ESS) MENU

- ESS Dynamic Messages - The PCM sends multiple signals to the IPC for ESS display messages. The PCM also sends the request to the IPC for the green telltale illumination requests during ESS stop events. There are over 30 ESS messages that the IPC can display to the customer. Refer to the owners manual for a full listing of messages.

AUDIO MENU - The IPC has a region of the display to show audio (Radio/Media Source) information on the IPC display. The radio sends the information that is being presented to the customer on the radio display over to the IPC over the CAN bus. The IPC displays the audio source information (AM, FM, USB, Bluetooth, AUX, CD, SD CARD, SATELLITE, DVD, DTV, APPS amongst other sources not listed) on the first line of the display region assigned to the audio information. Additional metadata information for the current audio source will be displayed on additional lines of the display.

SCREEN SETUP MENU - The screen setup menu will only display when speeds are below 8 km/h (5 mph). The IPC determines this based on a vehicle speed input from the ABS module. If the speed exceeds this limit, an EVIC screen display "SCREEN SETUP-NOT AVAILABLE-SPEED TOO HIGH" message will be prompted to the customer.

- Gear Display Screen Setup Sub Menu - The EVIC displays the transmission gear in full PRND, or single PRND style based on the driver selection using the steering wheel commands. This menu option exists only when equipped with an automatic transmission.
- Upper Left/Right Corner Screen Setup Sub Menu

- EVIC displays an indication of the following based on the driver selection using the following steering wheel commands:

- Compass - The compass feature provides the customer with current information about vehicle heading. The compass is visualized when the ignition is in either RUN or ACC states. The BCM determines whether or not a standalone compass module exists on the vehicle. Refer to the Remote Compass Module information below for functional service information.
- Outside Temperature - The external temperature display feature provides a stable and accurate ambient temperature value to be displayed to the driver. The IPC and the radio carry out the logic to enable or disable the visualization of the temperature display. The BCM provides a filtered temperature signal to the IPC in either Celsius or Fahrenheit, determined by the customer selection in the programmable options menu. The IPC then displays the temperature.
- Time - The radio, vehicle entertainment center and the IPC configure the time display behavior based on parameters broadcast on the CAN bus. The radio is the master for the vehicle date. The radio is required to keep accurate date information, provide additional features to support the date display, and to transmit the date over the CAN bus to the IPC, which displays the date. The radio allows the customer to manually set the date. The BCM gates multiple date and time bus signals from CAN-IHS to CAN-C in support of this feature.
- Range (distance to empty)
- Average Fuel Economy
- Current Fuel Economy
- Trip A
- Trip B
- Nothing

- Center Screen Setup Sub Menu

- The EVIC will display in the center an indication of the following options based on the driver selection when using the steering wheel commands:

- Compass
- Outside Temperature
- Time
- Range
- Average Fuel Economy
- Current Fuel Economy
- Trip A
- Trip B
- Audio Information
- Speedometer - Note: If the Speedometer is selected as the center configurable option, it should not display when in the "Speedometer" menu
- Menu Title
- Nothing
- Current Gear Sub Menu - The EVIC displays the current gear next to the D in the PRNDL if current gear display is selected. Otherwise the current gear will not be displayed.
- Odometer Display Sub Menu - The Odometer Display sub menu will give the driver the option of hiding/displaying the odometer based on the selection using the driver selection the steering wheel

commands.

- Favorites Menu

- The favorites submenu allows the driver to show or hide certain menus. When menus are hidden, the menu will not display in the scroll and the menu icon will not be shown in the scroll wheel. The following menus will be able to be shown/hidden based on the driver's preference:

- Off-Road
- Driver assist
- Fuel Economy
- Trip
- Start/Stop
- Audio

If any of these menu options are selected to be shown, the IPC will set an internal variable and then will display a checkmark in the favorites list and then show the selected menu as part of the IPC menu structure.

- Restore to Defaults Screen Setup Sub Menu - The EVIC will display default configurable sections if the "Restore" defaults selection is requested by the driver using the steering wheel commands.
- Speed Warning - The radio has a menu setting for speed limit audio warning in the navigation menu where the user can turn off this feature or select a user offset from current speed limit to trigger an audio warning. The radio generates a one time audio response to say the actual speed limit once the vehicle speed exceeds the sum of the actual current speed limit and user offset. The audio response will not trigger again until the vehicle speed descends below the actual current speed limit. The setting item for the speed limit audio warning is defaulted to be OFF in the navigation menu until turned ON by the customer.
- Passenger Airbag (PAB) - When the PAB switch is enabled or disabled, the Occupant Restraint Controller (ORC) will send a CAN-C signal to the IPC to illuminate the proper enabled or disabled message to the display to the driver.

LOW BRAKE FLUID LEVEL INDICATION - The BCM acquires the brake fluid level information when the ignition is transitioned to RUN. If the signal deems that the brake fluid is low, the BCM transmits a low fluid signal to the IPC over the CAN-C bus.

MALFUNCTION INDICATOR LAMP (MIL) OR CHECK ENGINE LAMP - The IPC manages misfire, Electronic Throttle Control (ETC) and MIL illumination according to information received over the CAN-C bus from the PCM and the TCM.

AIR BAG WARNING LIGHT - The ORC transmits a signal to the IPC in order to:

- indicate the presence of a failure of the ORC airbag system - Solid indicator
- indicate temporary calibration of the ORC - Temporary flashing indicator
- indicate initialization of the ORC - Temporary solid indicator
- indicate normal working status of the ORC - No indicator
- terminate the IPC bulb check. After the indicator lamp bulb check is completed, the ORC can then request the indicator as necessary.

The IPC receives a CAN-C lamp request from the ORC to manage indication of the ORC system failure or calibration. The IPC interprets the signals from the ORC to provide the correct IPC output signals for warning the customer. The IPC diagnoses the airbag warning light requests and stores possible faults permanently until a repair is completed on the concern. In the event that the request is sent from the ORC and it is determined that this will be a stored code, the IPC will then illuminate the indicator to the customer. The IPC then transmits a signal back to the ORC indicating the airbag warning light state.

In the event of ORC calibration, the IPC will flash illuminate the indicator for temporary calibration or hold the indicator steady for ORC initialization. The IPC will deactivate the indicator once the IPC receives a CAN-C message from the ORC that states that the calibration is completed successfully.

SEAT BELT REMINDER WARNING LIGHT - In order for the IPC to correctly drive the seatbelt reminder indicator, the ORC communicates the status of the seatbelt buckle switches along with the front passenger presence status. The seatbelt reminder lamp is a dedicated indicator for this function and it indicates both driver and front passenger seatbelt buckle status using one ISO symbol.

The ORC acquires, validates, and then sends the change of seatbelt buckle status to the IPC. Whenever the seatbelt buckle changes from fastened to not fastened, the ORC receives this change and forwards this to the IPC. If the seatbelt is unbuckled and the ignition switch is moved to the "ON" or "START" position, the IPC will activate a slow audio signal and illuminate the visual indicator for a period of six seconds.

The Occupant Detection System (ODS) is also managed by the ORC. The ODS detects when a seat is occupied versus unoccupied. Like the seatbelt buckle status, the ORC acquires, validates, and then sends the change of occupant detection status to the IPC for illumination when required.

AUXILIARY SWITCH BANK

Refer to [COMPONENT INDEX](#).

Four auxiliary switches located in the auxiliary switch bank of the instrument panel can be used to power various aftermarket products and solutions. The auxiliary switches can be programmed and configured via the UconnectB® settings. All switches can be configured for setting the switch type operation to latching or momentary, power source of either battery or ignition, and ability to hold last state across key cycles. The BCM stores the switch state and will transmit the last known switch state values to the ASBM when the BCM detects the ignition state has changed to RUN. If this feature to recall last known state is not enabled, the BCM will transmit the current ASBM switch states instead.

NOTE: **Holding last state conditions are met when switch type is set to latching and power source is set to ignition.**

The auxiliary switches manage the relays that power four blunt cut wires. These wires are located under the instrument panel in the passenger compartment and under the hood to the right, near the battery. In addition to the four auxiliary switch wires, a fused battery wire and ignition wire are also located in the interior, in the passenger side under the instrument panel.

A kit of splices and heat shrink tubing are provided with the auxiliary switches to aid in the connection/installation of customer electrical devices.

WIRE COLOR CHART

CIRCUIT FUNCTION	FUSE	WIRE COLOR	LOCATIONS
Aux Switch 1	40 Amp	Beige/Pink	Interior (passenger side under instrument panel) and Underhood (right side near battery)
Aux Switch 2	40 Amp	Green/Pink	Interior (passenger side under instrument panel) and Underhood (right side near battery)
Aux Switch 3	15 Amp	Orange/Pink	Interior (passenger side under instrument panel) and Underhood (right side near battery)
Aux Switch 4	15 Amp	Dark Blue/Pink	Interior (passenger side under instrument panel) and

			Underhood (right side near battery)
Battery	10 Amp	Red/White	Interior (passenger side under instrument panel)
Ignition	10 Amp	Pink/Orange	Interior (passenger side under instrument panel)

The ASBM is able to determine the current state of all its switches, pressed and active. The ASBM detects when a switch is being pressed and changes the LED indication status accordingly.

The ASBM receives its ignition state functionality by a Local Interface Network (LIN) signal from the BCM. The ASBM uses this signal to determine the ignition state. The ASBM also participates in the load shedding strategy. This is managed by BCM outputs to the ASBM. If battery voltage dips low, the BCM will turn off the ASBM outputs until proper battery power is restored.

Aux Off Road Switch Function

The BCM receives the request for the off road from the ASBM. The BCM uses this signal as an input to request "Off Road" as the active drive mode. The BCM then applies a global drive mode selection based on that input values from the switch. The BCM then sends a CAN-C message to the IPC to request a global drive mode status popup on the display screen as well as a LIN output to the ASBM to turn the LED indicator ON. The TCM manages the drive modes based on a CAN message request from the BCM indicating the customer selection.

Inputs

- ASBM configuration data from the BCM
- Ignition state from the BCM
- Aux enable from the BCM
- Aux switch type from the BCM
- Aux switch power mode from the BCM
- Aux switch cutoff from the BCM
- Aux switch enable last known state from the BCM
- Aux switch requests

Outputs

- Aux switch 1-4 ON to the BCM
- ASBM aux relay hardwired command
- Aux switch LED commands

BODY CONTROL MODULE (BCM)

Refer to COMPONENT INDEX .
--

The BCM is the configuration and the gateway master for this vehicle. The BCM also supports several of the IPC features by providing inputs from other components in the vehicle.

Inputs

- ASBM ON switch state
- Battery voltage
- Commanded ignition state
- Battery health and state of charge
- Engine speed

- ESS state
- Text display data from the radio
- Audio mode for the cabin/driver from the radio
- Phone pop active signal from the radio
- Radio compass direction from the radio
- Radio with gyro present from the radio
- Standalone compass signals for direction, calibration, faults and variance
- Compass variance and calibrations requests from the radio
- Clock/Date configuration data from the radio
- Steering wheel switch (EVIC) commands
- Brake fluid level sensor fluid level information
- Navigation data from the radio for gating to the IPC
- Oil life algorithm data from the PCM
- Vehicle speed - displayed signal from the IPC
- Vehicle speed signal is in MPH format from the IPC
- Request for oil level/oil pressure indicator lamp from the PCM for gating
- Engine RPM value from the PCM for gating
- Primary fuel sensor input
- Average fuel level from the IPC

Outputs

- Aux unavailable due to battery charging display request to the IPC
- ASBM configuration data to the ASBM
- Ignition state to the ASBM
- Aux enable to the ASBM
- Aux switch type to the ASBM
- Aux switch power mode to the ASBM
- Aux switch cutoff to the ASBM
- Aux switch enable last known state to the ABSM
- Text display data from the radio to the IPC
- Audio mode for the cabin/driver from the radio to the IPC
- Phone pop display active signal from the radio to the IPC
- Driver door ajar signal to the IPC
- Commanded ignition state to the IPC
- Vehicle configuration to the radio or IPC that includes:
 - Country code
 - Automatic transmission type
 - Adaptive Cruise Control (ACC) type equipped
 - Special sales code package
 - IPC ECU configurations
 - UREA/SCR present
 - Audio and telematics ECU configuration data
 - ECU configuration messages status
- Gated signal for distance traveled by left wheel and right wheel to the radio
- Gated signal for wheel pulse counter for all four wheels to the radio

- Gated signal for vehicle speed to the radio
- Compass mounting angle, orientation, vehicle in motion and remote compass module configuration signals to the compass module
- Clock/Date configuration data to the IPC
- Steering wheel switch command signals to the IPC
- Ambient temperature average to the IPC in Fahrenheit or Celsius
- Temperature units; Fahrenheit or Celsius to the IPC
- Display outside temperature present to the IPC
- Brake fluid low level indicator request to the IPC
- Gated navigation data to the IPC
- Gates the vehicle speed - displayed to the CAN-C bus
- Gates the vehicle speed signal is in MPH format to the CAN-C bus
- Battery system voltage value to the IPC
- Type of ACC system present to the IPC
- DASM present to the IPC
- Vehicle configuration of the tachometer type to the IPC
- Fuel voltage to the IPC

ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH

Refer to [**COMPONENT INDEX**](#).

The EVIC steering wheel switch monitors voltage levels received from the steering wheel buttons corresponding to specific hardwired signals. Those signals are interfaced using discrete circuits and then the steering wheel switch sends the steering wheel button status on the LIN bus to the BCM. The BCM receives the pressed or released status of each steering wheel button from the steering wheel switch on LIN and then the BCM gateways each steering wheel signal onto the CAN-C. The BCM, as the LIN master, requests a button status from the steering wheel switch, as the LIN slave to determine the button pressed/not pressed status.

The EVIC display is part of the IPC assembly and is not serviced as a separate component. If the EVIC is inoperative, the IPC assembly must be replaced. Refer to [**REMOVAL AND INSTALLATION**](#). If the EVIC function buttons are inoperative and require replacement, for the appropriate procedure. Refer to [**SWITCH, EVIC CONTROL, REMOVAL AND INSTALLATION**](#).

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [**COMPONENT INDEX**](#).

The IPC circuitry operates on battery current received through a fused B(+) fuse on a non-switched fused B(+) circuit. This arrangement allows the IPC to remain functional regardless of the status of the ignition switch. The IPC circuitry is grounded through a ground circuit and take out of the instrument panel wire harness with an eyelet terminal connector that is secured by a ground screw to a ground location on the instrument panel structural support.

The IPC gauges, indicators, LED units, control switches as well as the electronic display unit are all integral components of the IPC and its electronic circuit board. If any part of the IPC is damaged or ineffective, the entire IPC assembly must be replaced.

The BCM stores and compares vehicle configuration data with the IPC as well as with other Electronic Control Units (ECU) in the vehicle. If a configuration mismatch is detected, the BCM sets a DTC. A configuration mismatch DTC will require the performance of a Restore BCM Configuration routine, or a Configuration Alignment routine using a diagnostic scan tool.

Inputs

- Internal IPC to display for data text display

- Internal IPC to display for phone popup display
- Internal IPC to display for audio repetition
- Driver door ajar status from the BCM
- Passenger door ajar status from the BCM
- Vehicle speed from the ABS module
- Engine RPM from the PCM
- Commanded ignition state from the BCM
- Accessory delay active input from the BCM
- Engine Start/Stop (ESS) present signal from the PCM
- Vehicle configuration from the BCM including:
 - Country code
 - Automatic transmission type
 - Adaptive Cruise Control (ACC) type equipped
 - Special sales code package
 - IPC ECU configurations
- Steering wheel switch commands
- Speed (speedometer) units; miles
- Display compass heading from the BCM or radio
- Compass direction from the BCM
- Ambient temperature average from the BCM in Fahrenheit or Celsius
- Temperature units; Fahrenheit or Celsius from the BCM
- Display outside temperature present from the BCM
- Loose gas cap message from the PCM
- Navigation data gated from the BCM
- Oil life algorithm data from the PCM
- Increasing speed constant (offset for speedometer biasing) from the BCM
- Speedometer tolerance percentage (gain for speedometer biasing) from the BCM
- Distance traveled by the left and right wheel signals from the ABS module
- Default fuel economy from the PCM
- Fuel consumption from the PCM
- Fuel type from the PCM
- Number of engine cylinders from the PCM
- Fuel level voltage from the BCM
- Fuel capacity from the BCM
- Request for oil level/oil pressure indicator lamp from the PCM
- Oil pressure indicator from the PCM
- Engine running state from the PCM
- ESS event messages, illumination requests and pop up requests from the PCM
- Engine displacement input from the PCM
- Request for oil temperature warning indicator lamp from the PCM. This can either be HIGH or CRITICAL
- Oil temperature input from the PCM
- Engine coolant temperature from the PCM
- Transmission fluid temperature from the TCM
- Excessive transmission fluid temperature from the TCM

- Type of transmission equipped, manual or automatic, from the BCM
- Automatic transmission type from the BCM
- Battery system voltage value from the BCM
- Transfer case status from the DTCM
- DTCM present message from the BCM
- Steering wheel angle, sensor status and polarity messages from the SCCM
- Axle locker status message from the DTCM
- Axle locker system present message from the BCM
- Body style configuration message from the BCM
- Sway bar status message from the ASBS module
- Pitch and roll angles messages from the BCM
- ASBS present message from the BCM
- Vehicle speed from the ABS module
- Type of ACC system present from the BCM
- DASM present from the BCM
- Multiple bus messages from the DASM involving the ACC system display on the IPC
- Engine RPM for indication from the PCM
- Vehicle configuration of the tachometer type from the BCM
- PCM MIL and warning indicator requests
- TCM MIL and warning indicator requests from the PCM
- PCM ETC indicator requests
- Seatbelt buckle status from the ORC (buckled or unbuckled)
- ODS status from the ORC (occupied or unoccupied)
- Reverse gear engaged/not engaged for manual transmission from the BCM
- PRND status from the BCM
- Seatbelt reminder present configuration from the BCM

Outputs

- Internal signals to the display area of the IPC
- Odometer reading to the BCM for gating
- Average fuel economy to the BCM
- Instantaneous fuel economy to the BCM
- All trip data information signals to the radio to be sent to the mobile application and or used in other features by the radio
- ESS display status to the PCM
- Averaged and extended averaged fuel level to the BCM

RADIO

Refer to COMPONENT INDEX .

The Radio sends spontaneous CAN messages to communicate information to the IPC display. The IPC uses these messages to display radio data in the area allocated for Audio/Video source information.

Inputs

- Audio and telematics ECU configuration from the BCM
- ECU configuration messages status from the BCM
- Gated signal for distance traveled by left wheel and right wheel from the BCM

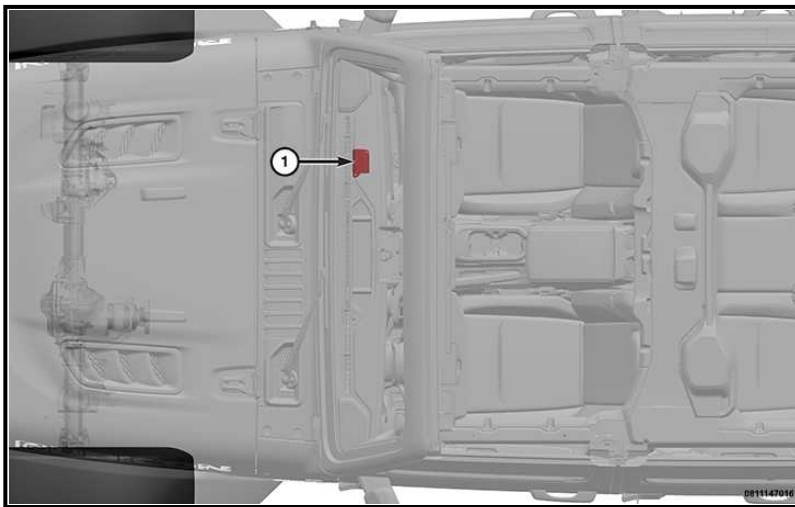
- Gated signal for wheel pulse counter for all four wheels from the BCM
- Gated signal for vehicle speed from the BCM
- Compass display from the BCM
- Gated messages for language, distance units and speed unit

Outputs

- Radio compass direction to the BCM
- Radio with gyro present to the BCM
- Display compass heading to the BCM or IPC
- LTM radio equipped - Compass variance, direction and calibration state to the BCM
- Navigation data information to the BCM

REMOTE COMPASS MODULE

Refer to [COMPONENT INDEX](#).



The compass feature provides the customer with current information about vehicle heading. The compass is visualized when the ignition is in either RUN or ACC states. The BCM determines whether or not a standalone compass module exists on the vehicle.

Compass Heading Calculations - If a standalone compass module is present and the radio is equipped with gyro, the BCM will ignore the data coming from the compass module and only use the data from the gyro for heading direction. The BCM is responsible for sending the heading direction to the IPC.

The compass gathers the true north position using the earth's magnetic field and applies the compass variance to determine the compass direction. The compass master provides hysteresis to prevent the display heading from switching back and forth repeatedly while driving along a switch point. As part of the hysteresis, the compass master will not change the heading until the heading angle exceeds or drops below the normal switch point by 2.5 degrees or more. An example of this is that the switch point between north and north east is 22.5 degrees. When driving north along that line, the compass master will hold the heading "N" until the heading angle reaches 25 degrees, then it may update to "NE". Consequently, it will not change back to "N" until the heading angle drops below 20 degrees.

Compass data transfer - The BCM communicates with the compass over the LIN bus. The compass sends heading direction, variance value, calibration mode status, calibration request and the state of calibration faults to the BCM.

The BCM sends to the compass the status of the vehicle (whether it is moving or not), the mounting orientation, the mounting angle and the request for calibration or changing in the variance. The BCM then broadcasts and sends the compass direction to the IPC.

Compass Variance Setting - The compass can only increment its variance zone value one step at a time. This requires that the BCM sends several increment requests to the compass if the compass variance is more than one variance away. The compass default value for the variance is set to the North East United State setting, or zone-8.

The compass is able to have its calibration and variance value saved in non volatile memory, eliminating the need of compass recalibration or reset of the variance every time the power cycles or a battery disconnect occurs.

Manual Compass Calibration - The customer is able to calibrate the compass manually when the system is supported by the compass module. When the customer selects to calibrate the compass, the BCM sends a LIN command to the compass module to calibrate. The compass module will then return a LIN signal to the BCM indicating that calibration is complete. Once this signal is received by the BCM, the BCM sends a CAN-IHS message to the IPC with the new compass data calibration information.

STEERING COLUMN CONTROL MODULE (SCCM)

Refer to [COMPONENT INDEX](#).

The SCCM sends CAN messages to the IPC indicating the steering angle value to support a menu display option in the IPC.

Inputs

- Steering wheel switch pass through for EVIC selections

Outputs

- Steering angle value to the IPC
- Steering wheel switch pass through for EVIC selections

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - INSTRUMENT CLUSTER

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

If all of the Instrument Panel Cluster (IPC) gauges and indicators are ineffective, be certain to check the IPC fused B(+) fuse and the IPC fused B(+) and ground circuits for shorts or opens. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . Refer to [REMOVAL](#) , and Refer to [INSTALLATION](#) .

If an individual hard-wired gauge or indicator is ineffective, refer to the diagnosis and testing service information for that specific gauge or indicator. If an individual Controller Area Network (CAN) data bus message-controlled gauge or indicator is ineffective, perform the Self-Diagnostic Test.

CAUTION: Instrument clusters used in this vehicle automatically configure themselves for compatibility with the features and optional equipment in the vehicle in which

they are initially installed. The instrument cluster is programmed to do this by embedding the Vehicle Identification Number (VIN) and other information critical to proper cluster operation into electronic memory. This embedded information is learned through electronic messages received from other electronic modules in the vehicle over the Controller Area Network (CAN) data bus and through certain hard-wired inputs received when the cluster is connected to the vehicle electrically. Once configured, the instrument cluster memory may be irreparably damaged and certain irreversible configuration errors may occur if the cluster is connected electrically to another vehicle; or, if an electronic module from another vehicle is connected that provides data to the instrument cluster (including odometer values) that conflicts with that which was previously learned and stored. Therefore, the practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. Failure to observe this caution may result in instrument cluster damage, which is not reimbursable under the terms of the product warranty. Service replacement instrument clusters are provided with the correct VIN and the certified odometer values embedded into cluster memory, but will otherwise be automatically configured for compatibility with the features and optional equipment in the vehicle in which they are initially installed.

NOTE: Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If the problem being diagnosed involves improper illumination of an indicator for equipment options the vehicle does not have, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the ON position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the indicators accordingly.

SELF TEST

The self-diagnostic test will put the IPC into its test mode. In this mode the IPC can perform an actuator test that will confirm that the circuitry, the gauges and the indicators are capable of operating as designed. During the test the IPC circuitry will position each of the gauge needles at various calibration points, illuminate each of the segments in the Thin Film Transistor (TFT) display unit and turn all of the indicators ON and OFF again.

Successful completion of the self-diagnostic test will confirm that the IPC is operational. However, there may still be a problem with the Controller Area Network (CAN) data bus or another electronic control module that provides electronic message inputs to the IPC, or the inputs to one of these electronic control modules. Use a diagnostic scan tool to diagnose these components. Refer to the appropriate diagnostic information.

1. Begin the test with the ignition switch in the OFF position.
2. Depress the Electronic Vehicle Information Center (EVIC) **Down / Scroll** switch button on the left steering wheel spoke.
3. While still holding the **Down / Scroll** switch button depressed, turn the ignition switch to the ON position, but do not start the engine.
4. Release the **Down / Scroll** switch button.
5. The IPC will simultaneously begin to illuminate all of the operational segments in the TFT display unit and perform a bulb check of each operational Light Indicating Diode (LED) unit indicator. The TFT display segments and LED unit indicators remain illuminated as each gauge needle is swept to several calibration points and back. If a TFT display segment or an LED unit indicator fails to illuminate, or if a gauge needle fails to sweep through the calibration points and back during this test, the IPC must be replaced.
6. The self-diagnostic test is now complete. The IPC will automatically exit the self-diagnostic test mode and return to normal operation at the completion of the test. The self-diagnostic test will be aborted if the

ignition switch is turned to the OFF position, or if an electronic **vehicle speed** message indicating that the vehicle is moving is received over the CAN data bus during the test.

7. Repeat the test, if necessary.

STANDARD PROCEDURE

ENHANCED SEATBELT REMINDER PROGRAMMING

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or BELTMINDER feature that is enabled when the vehicle is shipped from the factory. This BELTMINDER feature provides extended and modified visual seatbelt indicator and audible chime warning responses to an unbuckled front seat belt through the Instrument Panel Cluster (IPC). The BELTMINDER feature may be disabled or enabled by the customer using the programming sequence that follows, or by the dealer using a diagnostic scan tool.

In order for the IPC to correctly drive the seatbelt reminder indicator, the ORC communicates the status of the seatbelt buckle switches (driver and front passenger) and the front passenger presence status. The seatbelt reminder warning light and audible feedback are a dedicated indicator for this function, and it indicates both driver and front passenger seatbelt buckle status using one ISO symbol. The first warning is only visual. If the seatbelt (s) are not buckled then the second and final warning is the visual indicator along with the slow 6 second audio chime. Both the indicator and chime functions are performed by the IPC.

CUSTOMER PROGRAMMING SEQUENCE

NOTE: The following sequence of events must occur within 60 seconds of the ignition being placed in the ON position in order for the programming to be completed successfully.

Perform the following procedure to modify the BELTMINDER feature:

1. With all doors closed and the ignition in any position except ON or START, buckle the driver side front seat belt.
2. Cycle the ignition to the ON position and wait for the seatbelt indicator reminder function to conclude (about six seconds).
3. Unbuckle and buckle the driver side front seat belt three or more times, ending with the belt buckled.
4. Cycle the ignition to any position except ON or START to toggle the BELTMINDER feature from its current setting (from active to inactive, or from inactive to active). A single chime tone will provide an audible confirmation that the programming sequence has been successfully completed.

REMOVAL AND INSTALLATION

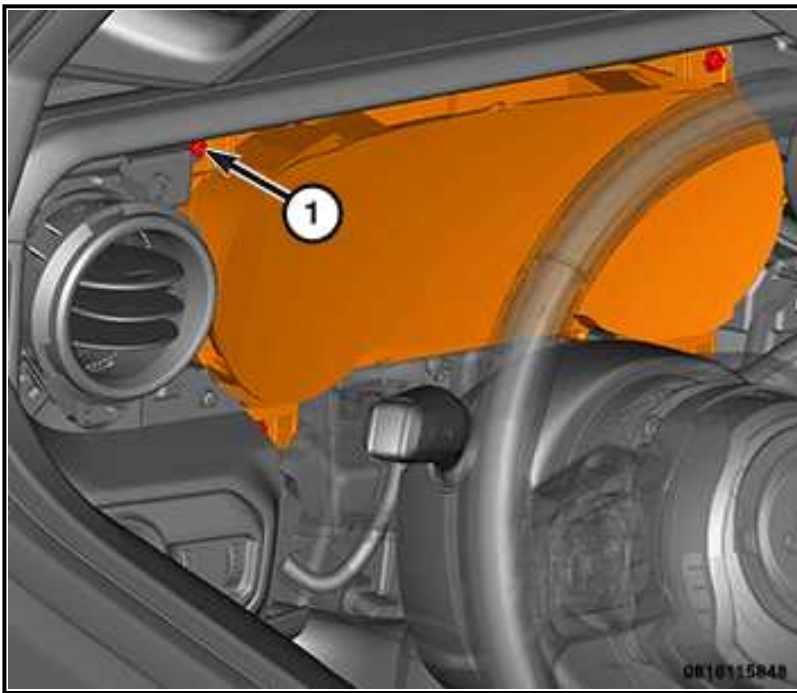
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the cluster bezel from the instrument panel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#) .

NOTE: Removal of the gap hider is not required.

3. Position the gap hider aside. Refer to [GAP HIDER, STEERING COLUMN SHROUD, REMOVAL AND INSTALLATION](#) .



4. Remove the fasteners (1) that secure the Instrument Panel Cluster (IPC) to the instrument panel armature.
5. Pull the top of the IPC rearward far enough to access and disconnect the instrument panel wire harness connectors from the back of the IPC housing.
6. Remove the IPC from the instrument panel.

INSTALLATION

1. Position the IPC close enough to the instrument panel to connect the wire harness connectors to the back of the IPC housing.
2. Position the IPC mounting tabs to the mounting holes in the instrument panel armature.
3. Install the fasteners that secure the mounting tabs of the IPC and tighten securely.
4. Install the gap hider. Refer to [GAP HIDER, STEERING COLUMN SHROUD, REMOVAL AND INSTALLATION](#).
5. Install the IPC bezel onto the instrument panel. Refer to [BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION](#).
6. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).

NOTE: Certain indicators in this IPC are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If a problem is noted that involves improper illumination of an indicator, disconnect and isolate the battery negative cable. After about five minutes, connect the battery negative cable and cycle the ignition to the ON position. The IPC should automatically relearn the equipment in the vehicle and properly configure the indicators.

POD, SWITCH

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

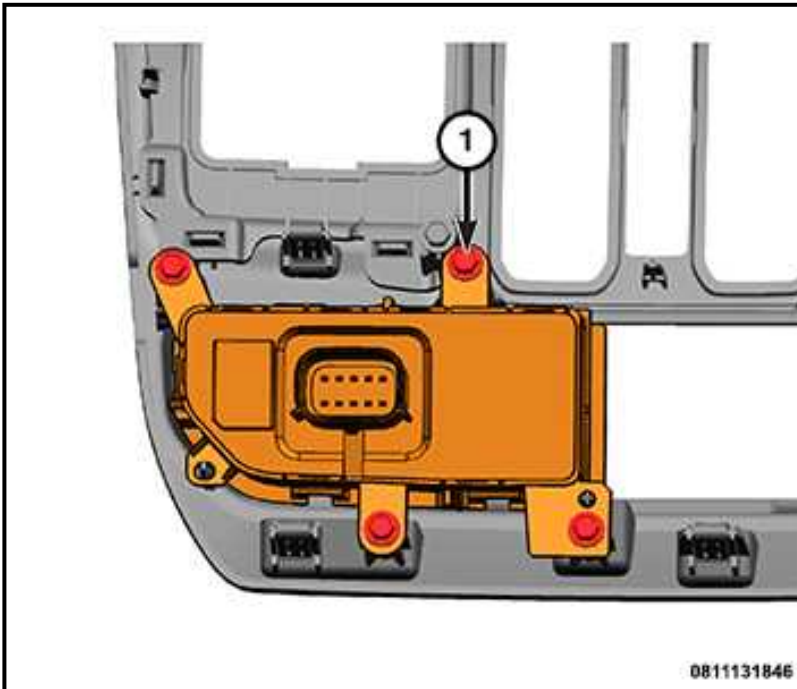
REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable and wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service.

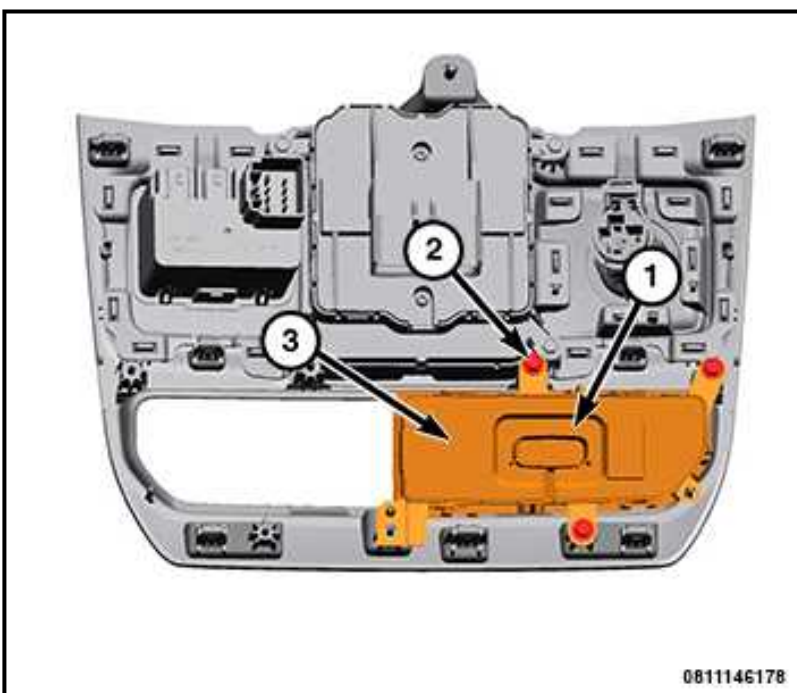
This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

NOTE: Take the proper precautions to protect the face of the center bezel from cosmetic damage while performing this procedure.

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
2. Remove the lower instrument panel center trim (4) and place it on a workbench. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#) .
3. Disconnect the auxiliary switch bank and, if equipped, off road switch wire harness connectors.



4. Remove the fasteners (1) that secure the accessory switch bank to the lower instrument panel center trim and remove the switch bank.



5. If equipped, remove the fasteners (2) that secure the off road switch (3) to the lower instrument panel center trim and remove the switch.

INSTALLATION

NOTE: Take the proper precautions to protect the face of the lower instrument panel center trim from cosmetic damage while performing this procedure.

1. If equipped, position the off road switch to the back of the lower instrument panel center trim and install the fasteners that secure it to the lower instrument panel center trim and tighten securely.
2. Position the accessory switch bank to the lower instrument panel center trim and install the fasteners that secure the accessory switch bank to the lower instrument panel center trim and tighten securely.
3. Connect the auxiliary switch bank and, if equipped, off road switch wire harness connectors.
4. Install the lower instrument panel center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).

SWITCH, EVIC CONTROL

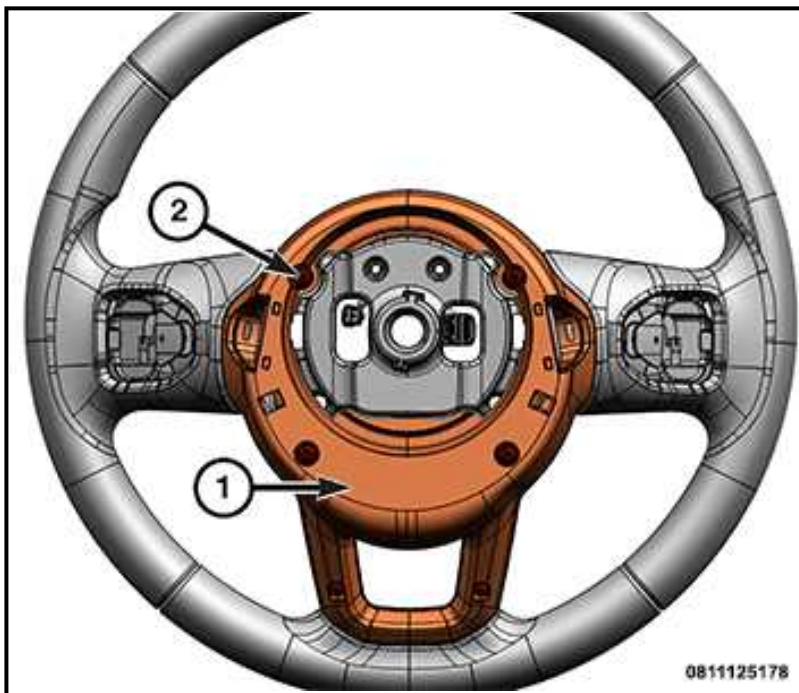
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

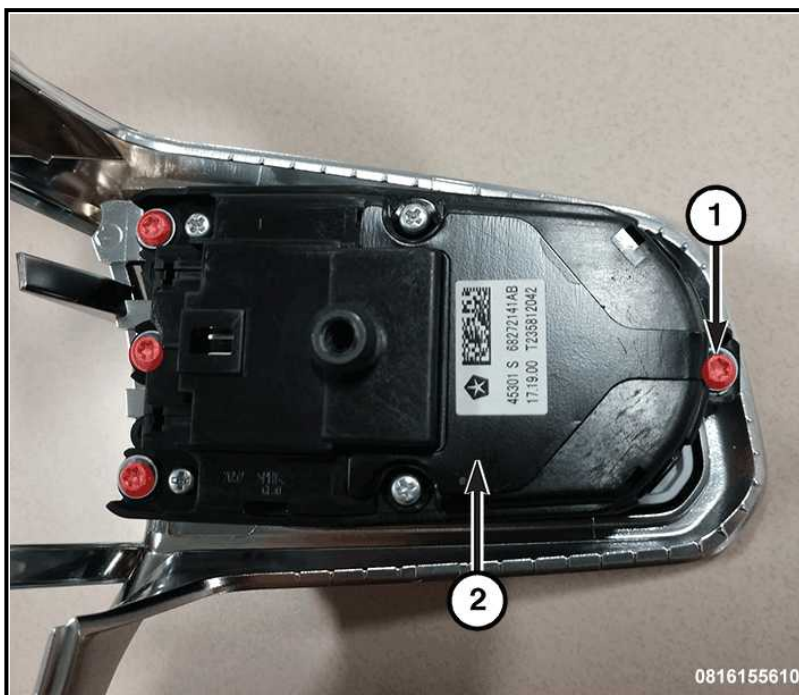
REMOVAL

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the negative battery cable(s). Refer to [CABLES, BATTERY](#), or [CABLES, BATTERY](#).
2. Remove the remote radio switch Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#).
3. Remove the steering wheel. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#).



4. Remove the fasteners (2) securing the steering wheel back cover (1) to the steering wheel, then remove the steering wheel back cover from the steering wheel.
5. Pull the steering wheel bezel away from the steering wheel and disconnect the cruise control switch and Electronic Vehicle Information Center (EVIC) switch wire harness connectors, then remove the bezel with switches.



6. Remove the fasteners (1) securing the EVIC switch to the bezel and remove the EVIC switch (2) from the bezel.

INSTALLATION

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to

disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the EVIC switch to the steering wheel bezel.
 2. Install the fasteners securing the EVIC switch to the bezel and tighten securely.
 3. Position the bezel to the steering wheel and connect the cruise control and EVIC switch wire harness connectors.
 4. Install the fasteners securing the steering wheel back cover to steering wheel and tighten securely.
 5. Install the steering wheel. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#) .
 6. Install the remote radio switch Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
 - .
 7. Connect the negative battery cable(s). Refer to [CABLES, BATTERY](#) , or [CABLES, BATTERY](#) .
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2021 GENERAL INFORMATION

(Integrated Center Stack Module - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
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<u>B157F-2A</u>	B157F-2A - BUTTON/KNOB - STUCK
<u>B210A-00</u>	B210A-00 - SYSTEM VOLTAGE LOW
<u>B210B-00</u>	B210B-00 - SYSTEM VOLTAGE HIGH
<u>B210D-00</u>	B210D-00 - BATTERY VOLTAGE LOW
<u>B210E-00</u>	B210E-00 - BATTERY VOLTAGE HIGH
<u>U0010-00</u>	CAN INTERIOR BUS
<u>U0011-00</u>	CAN INTERIOR BUS OFF PERFORMANCE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0164-00</u>	LOST COMMUNICATION WITH HVAC CONTROL MODULE
<u>U0184-00</u>	LOST COMMUNICATION WITH RADIO
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
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<u>U0485-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RADIO
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<u>U1430-00</u>	IMPLAUSIBLE DATA RECEIVED FROM COMFORT SEAT AND WHEEL MODULE

DIAGNOSIS AND TESTING

B156E-96 - INTEGRATED CENTER STACK (ICS)-COMPONENT INTERNAL FAILURE

THEORY OF OPERATION

The Integrated Center Stack (ICS) is the customer interface control for many vehicle features such as Heating Ventilation and Air Conditioning (HVAC), Heated Seats, Heated Steering Wheel, Hazard Switch, Electronic Stability Control (ESC), and other various features depending on the vehicle's option configuration. The ICS receives a direct Battery B(+) from the Power Distribution Center (PDC) and has a body ground. Actuating a function by the use of any ICS button or knob sends a signal via CAN IHS through the CAN IHS Star Connector then to either the Body Control Module (BCM) or the corresponding module for which the intended function was actuated.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Integrated Center Stack (ICS) has detected a RAM abnormality.
- The ICS has detected a ROM CheckSum error.

DEFAULT ACTION

- No control of all ICS functions.

POSSIBLE CAUSES

Possible Causes
WIRING/CONNECTORS
INTEGRATED CENTER STACK (ICS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all related Integrated Center Stack (ICS) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ICS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Replace the Integrated Center Stack (ICS) in accordance with the Service Information. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B157F-2A - BUTTON/KNOB - STUCK

THEORY OF OPERATION

The Integrated Center Stack (ICS) is the customer interface control for many vehicle features such as Heating Ventilation and Air Conditioning (HVAC), Heated Seats, Heated Steering Wheel, Hazard Switch, Electronic Stability Control (ESC), and other various features depending on the vehicle's option configuration. The ICS receives a direct Battery B(+) from the Power Distribution Center (PDC) and has a body ground. Actuating a function by the use of any ICS button or knob sends a signal via CAN IHS through the CAN IHS Star Connector then to either the Body Control Module (BCM) or the corresponding module for which the intended function was actuated.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- Radio active on the bus.
- Integrated Center Stack (ICS) active on the bus.

SET CONDITION

- The Integrated Center Stack (ICS) detects a closed switch for greater than 120 seconds.

DEFAULT ACTION

- The customer cannot control any of the ICS buttons.

POSSIBLE CAUSES

Possible Causes
DEBRIS IN SWITCH

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK BUTTONS FOR PROPER FUNCTION

1. Turn the ignition off.
2. Check all Integrated Center Stack (ICS) buttons for something that may prevent its proper function.

Are the buttons working properly?

Yes

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Integrated Center Stack (ICS) in accordance with the service information. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B210A-00 - SYSTEM VOLTAGE LOW

THEORY OF OPERATION

The Integrated Center Stack (ICS) is the customer interface control for many vehicle features such as Heating Ventilation and Air Conditioning (HVAC), Heated Seats, Heated Steering Wheel, Hazard Switch, Electronic Stability Control (ESC), and other various features depending on the vehicle's option configuration. The ICS

receives a direct Battery B(+) from the Power Distribution Center (PDC) and has a body ground. Actuating a function by the use of any ICS button or knob sends a signal via CAN IHS through the CAN IHS Star Connector then to either the Body Control Module (BCM) or the corresponding module for which the intended function was actuated.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.

SET CONDITION

- The code will set when the Integrated Center Stack (ICS) receives the Body Control Module (BCM) Can Bus message containing the system voltage below 10.0 volts.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM MALFUNCTION

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Perform the appropriate BCM DTC diagnostic procedure(s). Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B210B-00 - SYSTEM VOLTAGE HIGH

THEORY OF OPERATION

The Integrated Center Stack (ICS) is the customer interface control for many vehicle features such as Heating Ventilation and Air Conditioning (HVAC), Heated Seats, Heated Steering Wheel, Hazard Switch, Electronic Stability Control (ESC), and other various features depending on the vehicle's option configuration. The ICS receives a direct Battery B(+) from the Power Distribution Center (PDC) and has a body ground. Actuating a

function by the use of any ICS button or knob sends a signal via CAN IHS through the CAN IHS Star Connector then to either the Body Control Module (BCM) or the corresponding module for which the intended function was actuated.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Engine running.

SET CONDITION

- The code will set when the Integrated Center Stack (ICS) receives the Body Control Module (BCM) Can Bus message containing the system voltage above 16.0 volts.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM MALFUNCTION

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Perform the appropriate BCM DTC diagnostic procedure(s). Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B210D-00 - BATTERY VOLTAGE LOW

For a complete HVAC SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Integrated Center Stack (ICS) is the customer interface control for many vehicle features such as Heating Ventilation and Air Conditioning (HVAC), Heated Seats, Heated Steering Wheel, Hazard Switch, Electronic Stability Control (ESC), and other various features depending on the vehicle's option configuration. The ICS

receives a direct Battery B(+) from the Power Distribution Center (PDC) and has a body ground. Actuating a function by the use of any ICS button or knob sends a signal via CAN IHS through the CAN IHS Star Connector then to either the Body Control Module (BCM) or the corresponding module for which the intended function was actuated.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Engine running.

SET CONDITION

- The Integrated Center Stack (ICS) has detected that the voltage input is below 9.0 volts.

POSSIBLE CAUSES

Possible Causes
FUSED B+ FEED OPEN OR HIGH RESISTANCE GROUND CIRCUIT OPEN OR HIGH RESISTANCE CHARGING SYSTEM INTEGRATED CENTER STACK (ICS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCs present?

Yes

- Perform the appropriate PCM DTC diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. ISOLATE AND LOAD TEST THE (A231) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

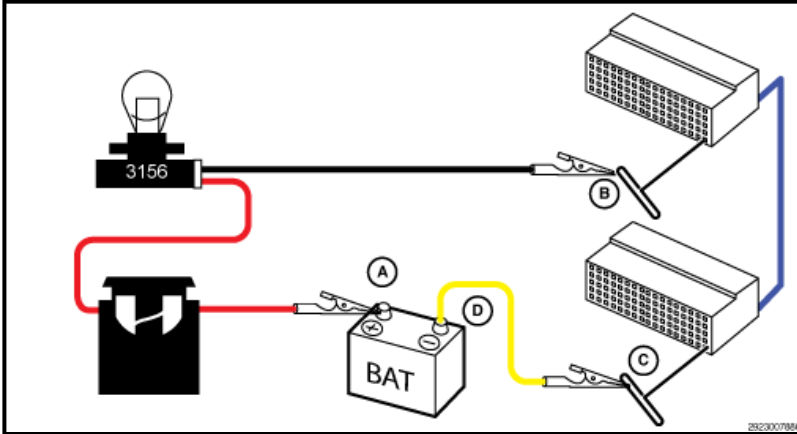
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



WARNING: To avoid possible serious or fatal injury, **DO NOT** load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION: Do not load test any circuits with components still connected to the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (A231) Fused B+ circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK THE (Z912) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

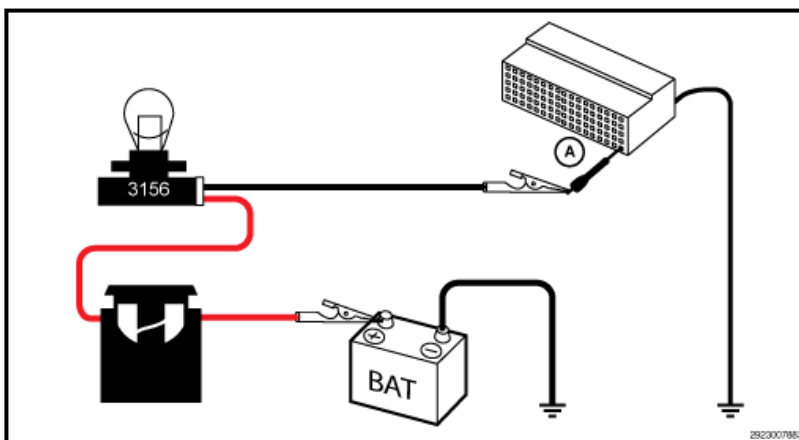
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (Z912) Ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all ICS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ICS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Start the engine.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Replace the Integrated Center Stack (ICS) in accordance with the Service information. Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

B210E-00 - BATTERY VOLTAGE HIGH

THEORY OF OPERATION

The Integrated Center Stack (ICS) is the customer interface control for many vehicle features such as Heating Ventilation and Air Conditioning (HVAC), Heated Seats, Heated Steering Wheel, Hazard Switch, Electronic Stability Control (ESC), and other various features depending on the vehicle's option configuration. The ICS receives a direct Battery B(+) from the Power Distribution Center (PDC) and has a body ground. Actuating a function by the use of any ICS button or knob sends a signal via CAN IHS through the CAN IHS Star Connector then to either the Body Control Module (BCM) or the corresponding module for which the intended function was actuated.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Engine running.

SET CONDITION

- When the Integrated Center Stack (ICS) has detected that the voltage input to the module is above 16.0 volts.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM INTEGRATED CENTER STACK (ICS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCs present?

Yes

- Perform the appropriate PCM DTC diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all ICS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ICS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Start the engine.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ICS DTCs.

Is the same DTC active?

Yes

- Replace the Integrated Center Stack (ICS) in accordance with the Service information. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repairing the wiring harness or connections corrected the problem.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

U0010-00-CAN INTERIOR BUS

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable CAN IHS Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** ..

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0164-00-LOST COMMUNICATION WITH HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0184-00-LOST COMMUNICATION WITH RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0424-00-IMPLAUSIBLE DATA RECEIVED FROM HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0485-00-IMPLAUSIBLE DATA RECEIVED FROM RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U120E-00-LOST COMMUNICATION WITH COMFORT SEAT AND WHEEL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1430-00-IMPLAUSIBLE DATA RECEIVED FROM COMFORT SEAT AND WHEEL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

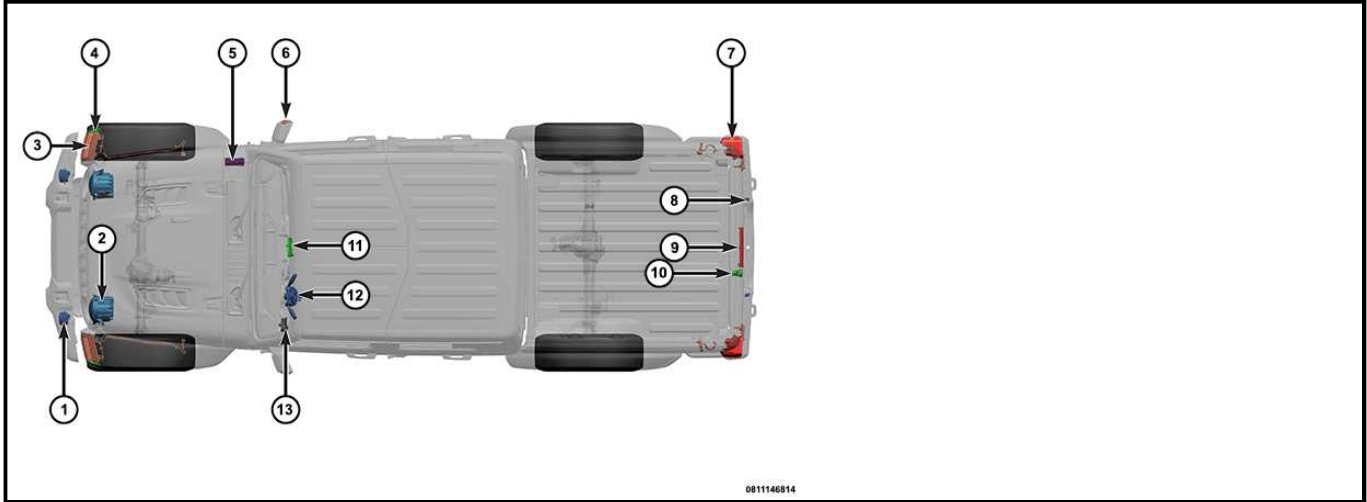
2021 ACCESSORIES AND BODY, CAB

Lamps/Lighting - Exterior (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Exterior Lighting system is comprised of several different components. Those components are:

COMPONENT INDEX

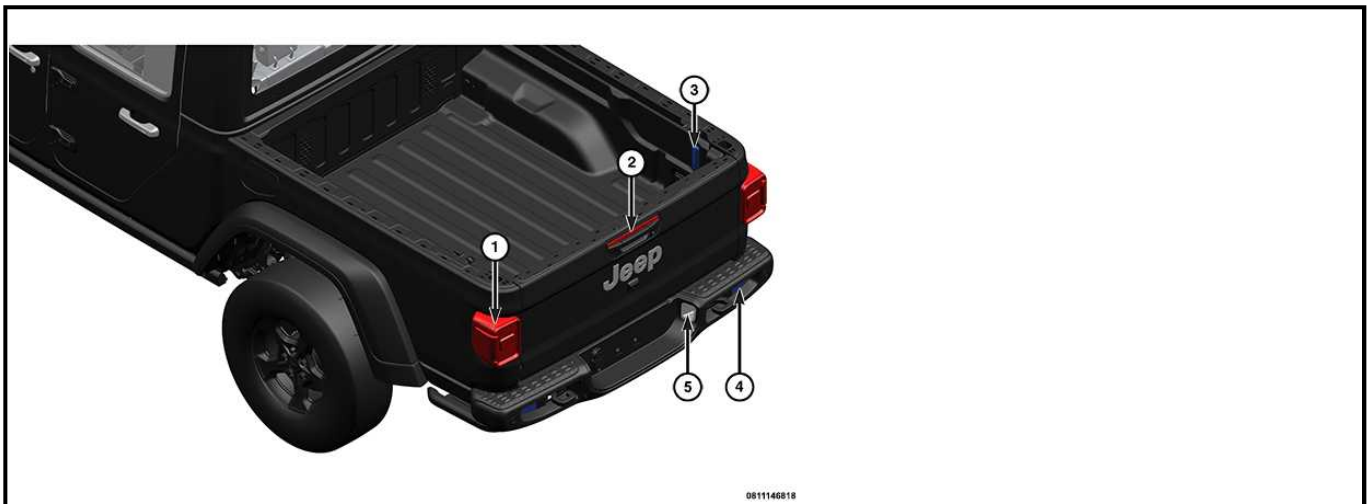
1.	Refer to <u>FRONT FOG LAMPS</u> .
2.	Refer to <u>FRONT HEADLAMPS</u> .
3/4.	Refer to <u>FRONT PARK/TURN SIGNAL</u> .
4.	Refer to <u>SIDE REFLECTOR LAMPS</u> .
5.	Refer to <u>BODY CONTROL MODULE (BCM)</u> .
6.	Refer to <u>EXTERIOR MIRROR REPEATER LAMPS</u> .
7.	Refer to <u>REAR COMBINATION LAMPS</u> .
8.	Refer to <u>LICENSE PLATE LAMP</u> .
9.	Refer to <u>CENTER HIGH MOUNTED STOP LAMP (CHMSL)</u> .
10.	Refer to <u>TRAILER TOW</u> .
11.	Refer to <u>DRIVER ASSIST SYSTEM MODULE (DASM)</u> .
12.	Refer to <u>LEFT STEERING COLUMN STALK - STEERING COLUMN CONTROL MODULE</u> .
13.	Refer to <u>HEADLAMP SWITCH</u> .

Front Exterior Lamps and Lighting



1. **Turn Signal Lamps** - The front turn signal lamps are integral to each front park/turn lamp unit.
2. **Park Lamps** - The front park lamps are integral to each front park/ turn lamp unit and, if the vehicle is so equipped, the clear position lamp bulb integral to each fender lamp unit.
3. **Repeater Lamps** - In certain markets where they are required, the repeater lamps on each front exterior door mirror will also be included in the front turn signal circuits.
4. **Headlamps** - A base or premium front headlamp is mounted to the front end module support at each upper outboard corner of the grille panel. The premium Light Emitting Diode (LED) headlamp is serviced as an assembly.
5. **Fog Lamps** - Standard equipment base level front fog lamp units are mounted to the front bumper. Premium level LED front fog lamps are also available for this vehicle. The LED fog lamps are serviced as an assembly while the base level fog lamp bulbs can be replaced.

Rear Exterior Lamps and Lighting



1. Combination Rear Lamp

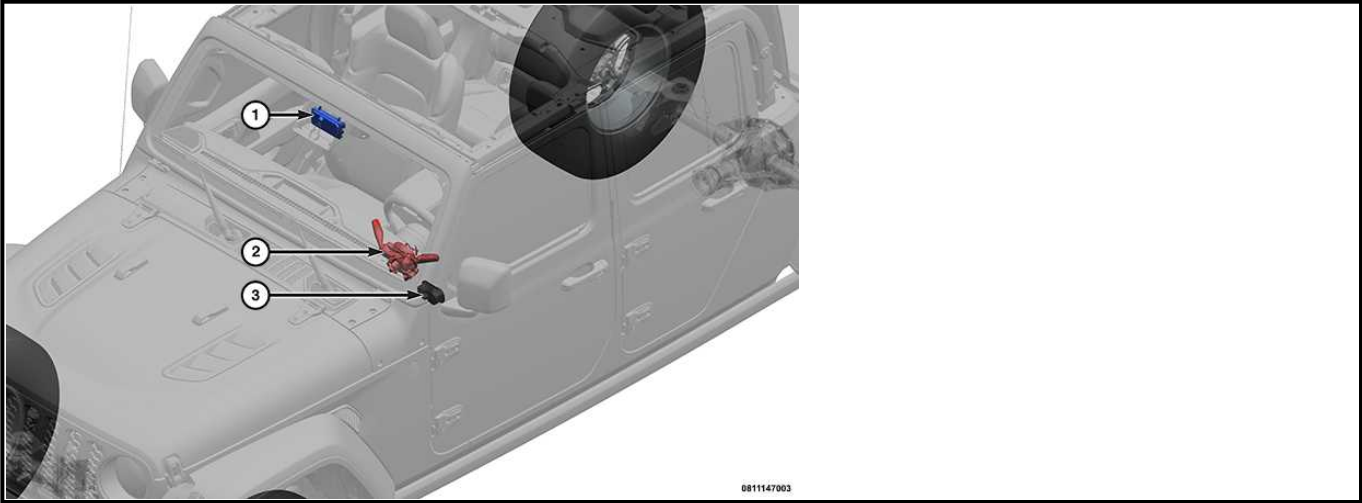
- A combination rear lamp unit is mounted to the rear of each rear body corner panel on either side of the swing gate opening. This lamp includes the tail lamp, stop lamps, turn lamps and backup lamps. There are two rear tail lamps available for this model:

- Rear Base Tail Lamp Stop/Tail - All bulbs are serviced.
- Rear Premium LED Tail Lamps - This lamp unit is serviced as an assembly

The premium version can be easily identified by rear reflex components which are located in the rear bumper. The base level vehicles do not include these components.

2. **Center High Mounted Stop Lamp (CHMSL)** - A LED CHMSL is mounted to the tailgate top. The CHMSL is serviced as an assembly.
3. **Bed Lamp** - There is a bed lamp on each side of the truck bed. Each lamp has an bed switch to activate or deactivate as well as a hard switch inside the cab of the vehicle.
4. **LED Reflector Lamps** - There is one reflector lamp located on each of the side of the rear bumper.
5. **License Plate Lamp** - There are two license plate lamps to each side of the license plate holder on the rear bumper.

Exterior Lamps and Lighting Controls



1. **DASM** - The DASM is used in the exterior lamps and lighting system to provide the automatic high beam feature.
2. **Left Steering Column Stalk - Steering Column Control Module**
 - The left multifunction switch is located on the steering column, just below the steering wheel. A control stalk that extends from the left side of the switch is used to select the turn signal lamps (right or left) and to select the headlamp beam (low, high or optical horn).
3. **Headlamp Switch**
 - The headlamp switch is located to the left of the steering column mounted to the instrument panel face.

Other components of the exterior lamps and lighting system can include the following components:

COMPONENT INDEX

COMPONENT INDEX

Backup Lamp Switch	A plunger-type backup lamp switch is installed through the transmission housing of vehicles equipped with a manual transmission and is actuated by the shifter mechanism within the transmission when REVERSE gear is selected. On vehicles with an optional automatic transmission a stand-alone Transmission Range Sensor (TRS) performs the backup lamp switch function.
Brake Lamp Sensor	A Rotatory-type brake lamp sensor is located on the brake pedal support bracket under the instrument panel and is actuated by the brake pedal arm when the brake pedal is pressed.
Clockspring - Turn Signal Cancel Cam	The clockspring includes an integral turn signal cancel cam, which provides automatic turn signal cancellation as the steering wheel is rotated back to its centered position following a vehicle turning maneuver. The clockspring is located near the top of the steering column, directly beneath the steering wheel. Select for operation information. Refer to CLOCKSPRING - TURN SIGNAL CANCEL CAM .

Hazard Switch	A latching push button-actuated hazard switch is integral to the switch pod located in the center stack area of the instrument panel.
Instrument Panel Cluster	The IPC is located in the instrument panel above the steering column opening, directly in front of the driver. Select for IPC operation information relative to the exterior lamps and lighting system. Refer to <u>INSTRUMENT PANEL CLUSTER (IPC)</u> .
Park Brake Switch	A park brake switch is located on the park brake lever mechanism on the floor panel transmission tunnel between the two front seats.
Steering Column Control Module	The Steering Control Module (SCCM) is located within the left multifunction switch housing on the top of the steering column, just below the steering wheel. .
Trailer Tow	Vehicles equipped with an optional Trailer Tow package have a trailer tow wire harness that is connected between the body wire harness and the left rear lamp unit to provide a take out and a molded four-way trailer tow connector secured to a bracket near the trailer hitch receiver below the rear bumper. Select for operation information. Refer to <u>TRAILER TOW</u> .

These exterior lighting lamp units and their controls are combined to provide the following exterior lighting features:

FEATURES

FEATURES

Automatic Headlamp Feature	The automatic headlamp feature is designed to automatically turn the exterior lights either ON or OFF depending on ambient lighting conditions. The headlamp switch needs to be in the AUTO position. Once in the AUTO position, the BCM uses the sun sensor to activate the exterior lights under the correct circumstances. The BCM contains an internal algorithm that mathematically assigns a value to the different light levels that the sun sensor detects. Once the light level threshold has been met, the BCM will activate the automatic headlamps.
Automatic High Beam	The auto high beam feature monitors road conditions and ambient lighting levels to determine the appropriate times to activate and deactivate the high beam lamps. The auto high beam is a customer programmable feature. The DASM acquires several CAN-C messages for system use. When lighting conditions are met and no objects are detected by the DASM, the DASM outputs a message on the CAN-C network indicating to turn the high beams are ON. The BCM checks the following conditions to enable the auto high beam feature: • Low beam status ON • Headlamp switch position ON • High beam stalk position is in HIGH BEAM • Auto high beam customer setting is ENABLED • Vehicle is travelling at or above 25 km/h (15 mph). Auto off will occur once the vehicle speed drops of 20 km/h (13 mph). Once all enabling conditions are met and the DASM is requesting high beams, the BCM will then activate the high beam lamps.
Daytime Running Lamps	DRLs are standard equipment on vehicles manufactured for sale in Canada and optional on vehicles manufactured for the United States. Select for operation information. Refer to <u>DAYTIME RUNNING LAMPS</u> .
Exterior Lamp Fail-Safe Operation	The IPC and the BCM provide a fail-safe feature which will automatically turn ON the low beam headlamps and all park lamps when the ignition

	position is in the ON position and there is no detected communication over the LIN or CAN data buses.
Exterior Lamp Load Shedding	The BCM provides a battery saver feature which will automatically turn OFF all exterior lamps that remain ON with the ignition position in the LOCK position after a timed interval of about eight minutes.
Hazard Warning Lamps	The hazard warning lamps include the bulbs, reflectors and lenses of each lamp in the right and left, front and rear turn signal circuits. Select for operation information. Refer to HAZARD WARNING LAMPS .
Headlamp and Park Lamp Load shed	The BCM controls the loadshed function for the exterior lights. An internal configuration parameter of the BCM determines if the exterior lights should loadshed when the headlamp switch is in the low beam position or in the park lamp position. When the ignition is OFF and the headlamp switch is in the low beam position or park lamp position, the BCM will load shed the exterior lamps after 8 minutes. Once the headlamp switch position is turned from low beam or park position to either OFF or AUTO, the BCM will restore normal function.
Headlamp Delay	Headlamp delay is a method to keep the low beams active for a specified amount of time. Park Lamps, fog lamps, turn signals, signature or DRLs do not function at this time. Select for operation information. Refer to HEADLAMP DELAY .
Headlamps ON with Wipers (HOWW)	HOWW is a feature designed to automatically turn on the headlamps when the wiper system is activated. This is a customer programmable option. HOWW is active when the option is enabled, the engine RPM is at or above 450, no active auto headlamp request is present and the headlamp switch is in the AUTO position. HOWW is cancelled by rotating the headlamp switch out of the AUTO position or disabling in the customer programmable options menu. HOWW is only available during daylight conditions.
Illuminated Approach	Illuminated approach activates the exterior lights for up to 90 seconds so that the driver is able to see obstacles when approaching the vehicle. Illuminated approach is activated when the BCM receives an unlock request from the RFH. When active, the BCM activates the low beam headlamps, the license plate lamp, the signature lamps and the rear parking lamps for the duration of the current customer programmable settle. If the BCM receives a lock request signal from the RFH, illuminated approach will then cancel.
Optical Horn	Also known as flash-to-pass, the beam selection function of the left multifunction switch control stalk has a momentary intermediate position that allows the headlamp high beams to be flashed momentarily, without changing the headlamp beam selection.
Remote Start Lighting	The BCM will activate all of the park lamp outputs after the ignition transitions from START to RUN. During a remote start event, the BCM will still honor illuminated approach requests.
Signature Lighting	The signature lighting is used as a decorative lighting feature to enhance the vehicles styling and visibility. The BCM uses internal parameters to determine if the feature is present on the vehicle. When the ignition is in the RUN or START position and remote start is not active, the BCM will turn on the signature lamp output.

OPERATION

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The exterior lamps and lighting system is managed by the BCM. The BCM serves as a gateway module between the various bus networks, allowing communication between all required components for lighting

operation. The BCM is also the LIN master to several of the lamps and lighting components.

Inputs

- Ambient temperature sensor data from the Heating, Ventilation and Air Conditioning (HVAC) module
- Transmission state PRNDL Display from the Transmission Control Module (TCM)
- Vehicle speed from the Automatic Brake System (ABS) module
- Radio Frequency Hub (RFH) requests
- Engine speed from the Powertrain Control Module (PCM)
- Engine revolutions per minute (rpm) from the PCM
- Headlamp switch - hardwired
- Hazard switch - hardwired
- Door ajar switch - hardwired
- Commanded ignition state
- Headlights on with washer internal request
- Fog lamp command from the fog lamp switch
- Hardwired turn signal request state from the SCCM
- Theft alarm and panic states - internal logic in the BCM
- Remote start flash request from the RFH
- Brake lamp request from ABS module CAN-C and hardwired for redundancy
- Brake pedal position status from the ABS module

Outputs

- DRL control - hardwired
- Park lamp control -hardwired
- License lamp control - hardwired
- Signature lamp control - hardwired
- Low beam control - hardwired
- High beam control - hardwired
- Reverse lamp control - hardwired
- Stop/Brake lamp control including CHMSL - hardwired
- IPC indicator requests
- Commanded ignition state to the IPC
- Door ajar state to the IPC
- Front and rear fog lamp control - hardwired
- Fog lamps state to the IPC
- Stop/Turn lamp commands - hardwired
- Trailer lamp controls - hardwired

CENTER HIGH MOUNTED STOP LAMP (CHMSL)

CENTER HIGH MOUNTED STOP LAMP (CHMSL)

Refer to [COMPONENT INDEX](#).

The brake lamps and the CHMSL each have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a screw to the body sheet metal. The BCM receives a battery voltage input whenever the brake lamp sensor is closed by the brake pedal arm. The BCM then energizes a high side driver, which provides battery voltage to the brake lamps and the CHMSL through a tail/stop lamp rear feed circuits.

CLOCKSPRING - TURN SIGNAL CANCEL CAM

CLOCKSPRING - TURN SIGNAL CANCEL CAM

Refer to [COMPONENT INDEX](#).

The turn signal cancel cam is concealed within the clockspring case on the steering column. The turn signal cancel cam consists of integral eccentrics on the outer circumference of the molded plastic clockspring rotor. The clockspring mechanism provides turn signal cancellation as well as a constant electrical connection between the horn switch, driver airbag, speed control switches, and remote radio switches on the steering wheel and the instrument panel wire harness on the steering column. The housing of the clockspring is secured to the steering column and remains stationary. The rotor of the clockspring, including the turn signal cancel cam lobes rotate with the steering wheel.

When the left multifunction switch control stalk is moved to a latched turn signal ON position, a turn signal cancel actuator is extended from the inside surface of the switch housing through a small rectangular opening on the left side of the clockspring case toward the turn signal cancel cam. As the steering wheel is rotated to complete the turn, one of the cam eccentrics will contact the actuator, automatically cancelling the turn signal event and releasing the latched left multifunction switch control stalk to the neutral or OFF position.

DAYTIME RUNNING LAMPS

DAYTIME RUNNING LAMPS

Refer to [FEATURES](#).

Vehicles equipped with the DRL feature illuminate the high beam of both headlamps at a reduced intensity when the engine is running, the parking brake is released, the headlamps are turned OFF, and the automatic transmission gear selector lever is in any position except PARK. The park lamps may be ON or OFF for DRL to operate. For vehicles with a manual transmission, the DRL will operate in any transmission gear selector lever position. The BCM must be programmed appropriately for this feature to be enabled.

Once enabled, anytime the BCM receives electronic messages over the CAN data bus from the Powertrain Control Module (PCM) indicating the engine is running, from the Instrument Panel Cluster (IPC) indicating the status of the left (lighting) multifunction switch is in any position except headlamps ON and the parking brake lever is released, and from the Transmission Control Module (TCM) indicating the automatic transmission gear selector lever is in any position except PARK, the BCM provides a pulse width modulated voltage output to the headlamp high beam headlamps through high side drivers on the right and left high beam feed circuits to produce illumination at a reduced intensity.

DRL DROPOUT - The BCM will drop the DRL output when either turn signal is active, the hazard lamps are active or an EARS event is active.

DRIVER ASSIST SYSTEM MODULE (DASM)

DRIVER ASSIST SYSTEM MODULE (DASM)

Refer to [COMPONENT INDEX](#).

The DASM is used in the exterior lamps and lighting system to provide the automatic high beam feature. For information on the automatic high beam system, refer to the. Refer to [FEATURES](#).

EXTERIOR MIRROR REPEATER LAMPS

EXTERIOR MIRROR REPEATER LAMPS

Refer to [COMPONENT INDEX](#).

If the configuration of the vehicle includes side repeater lamps, the BCM drives the output to these lamps synchronous to the turn signal lamp signal that drives the front and rear turn signals.

FRONT FOG LAMPS

FRONT FOG LAMPS

Refer to [COMPONENT INDEX](#).

The front fog lamps have a path to ground at all times through their connection to the engine compartment wire harness. The engine compartment wire harness has takeouts with eyelet terminals that are secured by nuts to ground studs on the front end sheet metal within the engine compartment. The Steering Control Module (SCCM) monitors a hard wired multiplex input from the left multifunction switch to determine whether the fog lamps are selected, then sends an electronic **front fog lamp switch status** message to the IPC over the Local Interface Network (LIN) data bus and the IPC relays an electronic **front fog lamp request** message to the BCM over the CAN data bus.

When the BCM receives a **front fog lamp request** message it then controls front fog lamp operation by controlling a battery voltage output through high side drivers on right and left fog lamp feed circuits. The BCM also sends the appropriate electronic message back to the IPC to illuminate or extinguish the front fog lamp indicator. In certain markets where required, the BCM will automatically de-energize the front fog lamps any time the headlamp high beams are selected.

The BCM also provides a battery saver (load shedding) feature for the front fog lamps, which will turn these lamps OFF if they are left ON for more than about eight minutes with the ignition switch in the LOCK position, if there is a charging system failure, or if the electrical system voltage falls below about 11.75 volts for more than about 30 seconds. The BCM will return the front fog lamps to normal operation when it detects that system voltage is greater than 13.0 volts for more than about 30 seconds.

Each front fog lamp includes an integral adjustment screw to be used for static aiming of the fog lamp beams.

FRONT HEADLAMPS

FRONT HEADLAMPS

Refer to [COMPONENT INDEX](#).

The headlamp system includes the IPC, BCM, headlamp switch and the SCCM on the steering column. The headlamp bulbs have a path to ground at all times through their connection to the engine compartment wire harness. The engine compartment harness has takeouts with eyelet terminals that are secured by nuts to ground studs on the front end sheet metal within the engine compartment. The BCM monitors headlamp switch inputs to determine whether the headlamp high or low beams are selected. The BCM then controls headlamp illumination through relays soldered onto the BCM internal circuit board. When the BCM detects a change in headlamp beam selection, the BCM energizes or de-energizes a high side driver, which controls an output to the solenoid that operates the shutter in each headlamp. The BCM also sends the appropriate electronic messages to the IPC to control the illumination of the high beam indicator. The BCM remembers which beams (LOW or HIGH) were selected when the headlamps were last turned OFF, and energizes those beams again the next time the headlamps are turned ON. Each headlamp includes an integral reflector adjustment screw to be used for static aiming of the headlamps. The BCM will store a Diagnostic Trouble Code (DTC) for any shorts or opens in the headlamp circuits.

FRONT PARK/TURN SIGNAL

FRONT PARK/TURN SIGNAL

Refer to [COMPONENT INDEX](#).

PARK LAMPS - The park lamps system includes the headlamp switch, the IPC and the BCM. The front park/turn lamp and the position lamp bulbs each have a path to ground at all times through their connection to the engine compartment wire harness. The engine compartment wire harness has takeouts with eyelet terminals that are secured by nuts to ground studs on the front end sheet metal within the engine compartment. The rear lamp units and license plate lamp bulbs have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a nut to a ground stud on the body sheet metal within the passenger compartment.

The BCM provides a battery saver (load shedding) feature for the park lamps, which will turn these lamps OFF if they are left ON for more than about eight minutes with the ignition switch in the LOCK position. The SCCM and the IPC each provide a fail-safe feature for the park lamps, which will send an electronic message to the BCM to turn these lamps ON automatically if there is no input available from the left multifunction switch. The BCM also provides a fail-safe feature for the park lamps that will turn these lamps ON automatically whenever a loss of CAN bus communication is detected with the ignition switch in the ON position.

TURN SIGNAL LAMPS - The turn signal lamps system includes the left (lighting) multifunction switch, the SCCM, the IPC and the BCM. The front turn signal lamp bulbs each have a path to ground at all times through their connection to the engine compartment wire harness. The engine compartment wire harness has a takeout with an eyelet terminal that is secured by a nut to a ground stud on the body sheet metal within the engine compartment. The rear turn signal lamp bulbs have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a nut to a ground stud on the body sheet metal within the passenger compartment.

The SCCM monitors a hard wired multiplex input from the left multifunction switch to determine the status of the turn signal switch, then sends the appropriate electronic **turn signal switch status** messages to the IPC over the CAN-C bus. Then the IPC relays an electronic **turn signal request** message to the BCM over the CAN data bus. The BCM responds to these messages by controlling a battery voltage output and the flash rate for either the right or left turn signal lamps through high side drivers on the appropriate right or left turn signal feed circuits. The BCM also sends the appropriate electronic messages back to the IPC to control the illumination and flash rate of the right or left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the IPC electronic circuit board that emulates the sound emitted by a conventional turn signal flasher.

The IPC also provides a **turn signal ON warning** that will generate repetitive chimes to indicate that a turn signal has been active continuously for 1.6 kilometers (1 mile) with the vehicle speed greater than 22 km/h (15 mph). Vehicles built for markets other than the United States and Canada have a revised distance threshold of 4 kilometers (2.49 miles) for this feature. The chime will continue until the turn signal input becomes inactive or until the vehicle speed message indicates that the speed is less than 22 km/h (15 mph), whichever occurs first.

SIDE MARKER LAMP - The side marker lamps are activated when the front or rear park lamps are activated except where prohibited.

HAZARD WARNING LAMPS

HAZARD WARNING LAMPS

Refer to [FEATURES](#).

The hazard warning system includes the IPC, the BCM and the hazard switch in the ICS, center area of the instrument panel. The hazard switch provides a hard wired input to the BCM. The BCM monitors the hazard switch input through an internal pull-up.

When the BCM receives an input from the hazard switch it controls hazard warning system operation and flash rate by controlling battery voltage outputs through high side drivers on the right and left turn signal feed circuits. The BCM also sends the appropriate electronic messages back to the IPC over the CAN data bus to control the illumination and flash rate of the right and left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered to the IPC electronic circuit board that emulates the sound emitted by a conventional hazard warning flasher. The BCM then sends messages to the ICS over the LIN data bus to control the illumination of the hazard switch push button.

HEADLAMP DELAY

HEADLAMP DELAY

Refer to [FEATURES](#).

The headlamp delay feature includes the left (lighting) multifunction switch, the SCCM, the IPC and the BCM. This feature has customer programmable delay intervals of 0 seconds (disabled), 30 seconds, 60 seconds and 90 seconds. If the left multifunction switch remains in the headlamp ON position until after the ignition switch is turned to the OFF position, then the headlamps will remain illuminated until after the selected delay interval has elapsed. The park lamps will not stay ON during the headlamp delay interval. The default delay interval is zero seconds (disabled), but can be reprogrammed by the customer using the customer programmable features function of the IPC. During the headlamp delay event, the BCM honors illuminated approach requests.

HEADLAMP SWITCH

HEADLAMP SWITCH

Refer to [COMPONENT INDEX](#).

The BCM reads the headlamp switch to determine the user operation requested. The BCM also makes the state of the headlamp switch available on the bus for other systems to recognize a change in the state.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [COMPONENT INDEX](#).

The IPC provides indication to the driver of certain lamps activations. The parking lamps indicator, turn signal indicator, high beam indicator and the lights ON warning indicator will illuminate when active.

In order to alert the driver the vehicle lights have been left in the on position, the IPC monitors the ignition switch position, park lamp status, and the driver door status.

The IPC also provides an instrument panel lighting mode signal that the BCM uses to determine if the automatic headlamps should be ON or OFF.

Inputs

- Vehicle configuration from the BCM
- Commanded ignition state from the BCM
- Door ajar state from the BCM
- Engine RPM from the PCM
- Gear position from the BCM
- Headlamp state from the BCM
- Park lamp state from the BCM
- DRL lamp state from the BCM
- Turn signal lamp indicator requests
- Wiper outside park position from the BCM
- Fog lamp state from the BCM
- High beam indicator request from the BCM
- Parking lamp indicator request from the BCM
- Lights ON warning indicator from the BCM

LEFT STEERING COLUMN STALK - STEERING COLUMN CONTROL MODULE

LEFT STEERING COLUMN STALK - STEERING COLUMN CONTROL MODULE

Refer to [COMPONENT INDEX](#).

The multifunction switch uses resistor multiplexing to control the many functions and features it provides using a minimal number of hard wired circuits. The switch receives clean grounds from the SCCM, then provides resistor multiplexed return outputs to the SCCM to indicate the selected switch positions. The SCCM then

sends electronic **switch status** messages over the CAN data bus to the BCM and other electronic modules in the vehicle.

If the SCCM detects no inputs from the multifunction switch, it transmits an electronic **Signal Not Available (SNA)** status message over the CAN data bus. The SNA status signals the other electronic modules to implement a fail-safe or default mode of operation. For the exterior lighting system, the multifunction switch fail-safe mode automatically selects LOW beams when the headlamps are turned ON. For the wiper system, the multifunction switch fail-safe mode will maintain the last selected wiper system mode of operation for the remainder of the current ignition cycle, after which the wiper system will default to OFF.

Following are descriptions of how the multifunction switch is operated to control the functions and features it provides:

- **Headlamp Beam Selection** - The headlamp high beams are selected when the multifunction switch control stalk is pushed forward to the high beam selection detent position. The low beams are selected when the control stalk is pulled rearward to the low beam selection detent position. The SCCM reads the input from the multifunction switch and sends an electronic **beam select switch status** message over the CAN data bus to the BCM and to other electronic modules in the vehicle.
- **Headlamp Optical Horn** - The headlamp optical horn is selected each time the multifunction switch control stalk is pulled fully rearward to a momentary position. The headlamp HIGH beams will remain illuminated for as long as the control stalk is held in this momentary position and the LOW beams will be restored when the control stalk is released. The SCCM reads the resistor multiplexed input from the multifunction switch and sends an electronic **beam select switch status** message over the CAN data bus to the BCM and to other electronic modules in the vehicle.
- **Turn Signal Control** - The turn signals are requested when the multifunction switch control stalk is moved downward (LEFT signal) or upward (RIGHT signal). The control stalk has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate, momentary position in each direction that automatically provides three turn signal blinks as a LANE CHANGE feature when the control stalk is tapped or will energize the turn signals for as long as the control stalk is held in the momentary position. When the control stalk is moved to a detent turn signal switch position, a cancel actuator extends from the multifunction switch through the SCCM mounting housing toward the center of the steering column. A turn signal cancel cam that is integral to the clockspring rotor rotates with the steering wheel and the cam lobes contact the cancel actuator when it is extended from the multifunction switch. When the steering wheel is rotated during a turning maneuver, one of the turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled. If the LEFT turn signal detent is selected, the lobes of the cancel cam will ratchet past the cancel actuator when the steering wheel is rotated to the left, but will unlatch the cancel actuator as the steering wheel rotates to the right and returns to center, which will cancel the turn signal event and release the control stalk from the detent so it returns to the neutral OFF position. The SCCM reads the resistor multiplexed input from the multifunction switch and sends an electronic **turn signal switch status** message over the CAN data bus to the BCM and to other electronic modules in the vehicle.

Inputs

- Left stalk turn requests

Outputs

- Optical Horn request to the BCM
- High beam state to the BCM
- Turn signal lever state to the BCM

LICENSE PLATE LAMP

LICENSE PLATE LAMP

Refer to **COMPONENT INDEX**.

The license plate lamp output is always be activated with the front or rear park lamps except where prohibited. If the LED license plates lamp configuration is present, the BCM disables the license plate lamp PWM hardware output.

REAR COMBINATION LAMPS

REAR COMBINATION LAMPS

Refer to [COMPONENT INDEX](#).

BACKUP LAMP - The backup (or reverse) lamps have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a nut to a ground stud on the body sheet metal within the passenger compartment. On vehicles with a manual transmission, the backup lamp switch provides a hard wired input to the (BCM) through a reverse switch signal circuit and the BCM provides battery voltage to the backup lamps on the backup lamp feed circuit whenever the ignition switch is in the ON position and the REVERSE position is selected with the transmission shift linkage.

On vehicles with an automatic transmission the Transmission Control Module (TCM) monitors a multiplex input from the Transmission Range Sensor (TRS), then sends the proper electronic **transmission gear selector status** messages to other electronic modules over the Controller Area Network (CAN) data bus. Whenever the ignition switch is in the ON position and the BCM receives an electronic message indicating the status of the transmission gear selector is REVERSE, it provides a battery voltage output through a high side driver to the backup lamps on the backup lamp feed circuit.

BRAKE LAMP - The brake (or stop) lamps and the Center High Mounted Stop Lamp (CHMSL) each have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a nut to a ground stud on the body sheet metal within the passenger compartment. The CHMSL receives battery voltage directly on the brake lamp switch output circuit when the brake lamp switch is closed by the brake pedal arm. The BCM also receives battery voltage on the brake lamp switch output circuit, which it uses as a signal to energize the brake lamps. The BCM provides battery voltage to the brake lamps through a high side driver on the tail/stop lamp rear feed circuit when it receives the proper input from the closed brake lamp switch.

REVERSE GEAR LAMP - The BCM monitors a CAN-C signal that gives the status of the transmission PRDN display. When the signal indicates **R** , the BCM activates the left and right reverse lamps and sends out an internal signal indicating that the reverse lamps are active for as long as the signal indicated **R** .

TURN SIGNAL LAMP - The turn signals can be activated using the left stalk switch input to the Steering Column Control Module (SCCM) which sends the command to the BCM over the CAN-C bus. When the turn signal lamps are switched on, the BCM activates a CAN-IHS signal corresponding to the selected side with a blinking scheme and synchronous to the lights activation. At the same time that the turn signal lights are switched ON, the BCM also activates internal signals that are active for the length of the turn signal event.

SIDE REFLECTOR LAMPS

SIDE REFLECTOR LAMPS

Refer to [COMPONENT INDEX](#).

Reflector lamps are equipped on this vehicle as a safety item that aids visibility of the vehicle.

TRAILER TOW

TRAILER TOW

Refer to [COMPONENT INDEX](#).

Domestic market vehicles equipped with an optional trailer tow package include a trailer tow wire harness connected between the body wire harness and the left rear lamp unit. The trailer tow harness includes a molded four-way trailer tow connector and an integral cover that are snapped into a bracket on the trailer hitch receiver platform.

Fused B+ for the plug receptacle is provided by the Power Distribution Center (PDC). The BCM determines if the trailer tow configuration is going to be used. The BCM is triggered to apply the vehicle configuration once the receptacle is in use. There are four relays in the PDC that the BCM manages in order to provide voltage feeds to the receptacle. They are backup lamp relay control, left rear turn signal relay control, right turn signal relay control, and tail lamp relay control. The BCM activates the proper lighting driver whenever the a trailer lamps status signal is active. This in turn causes the PDC relay to actuate and provide a trailer tow relay output feed to the receptacle. With the combined lighting, the BCM uses the same circuit and relay to request stop lamp activation. The trailer tow receptacle receives this feed through both the right and left rear stop/turn signal feeds.

DIAGNOSIS AND TESTING

EXTERIOR LAMPS AND LIGHTING

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: When diagnosing the exterior lighting circuits, remember that high generator output can burn out bulbs rapidly and repeatedly; and dim or flickering bulbs can be caused by low generator output or poor battery condition. If any of these symptoms are present, diagnose the battery and charging system, and repair as necessary.

NOTE: A good ground is necessary for proper lighting operation. If a lighting problem is being diagnosed that involves multiple symptoms, systems, or components, the problem can often be traced to a loose, corroded, or open ground.

WARNING: On vehicles equipped with the high voltage system, disconnecting the 12-volt battery negative cable alone will not power down the 12-volt system. You must perform the 12-volt Power Down procedure before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

The lamps and the hardwired circuits between components related to the exterior lighting system may be diagnosed using conventional diagnostic tools and procedures. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

ACRONYMS USED IN THE FOLLOWING SERVICE INFORMATION	
Body Control Module	BCM
Center High-Mounted Stop Lamp	CHMSL
Daytime Running Lamps	DRL
Instrument Panel Cluster	IPC
Integrated Center Stack	ICS
Transmission Range Sensor	TRS

Perform the following troubleshooting steps in the symptom based diagnostic tables to help diagnose any exterior lighting concerns:

STANDARD PROCEDURE

STANDARD PROCEDURE - FRONT LAMP AIMING

VEHICLE PREPARATION FOR LAMP ALIGNMENT

1. Check for and correct any burnt out bulbs.
2. If the vehicle is equipped with headlamp leveling, be certain that the headlamp leveling switch is in the 0 position.
3. Repair or replace any ineffective, worn or damaged body or suspension components that could hinder proper lamp alignment.
4. Verify proper tire inflation pressures.
5. Remove any accumulations of mud, snow or ice from the vehicle underbody and clean the front lamp lenses.
6. Verify that there is no load in the vehicle (cargo or passengers), except for the driver.
7. The fuel tank should be FULL. Add 2.94 kilograms (6.5 pounds) of weight over the fuel tank for each estimated gallon of missing fuel.
8. Verify correct vehicle suspension height.

LAMP ALIGNMENT SCREEN PREPARATION

The procedure that follows will prepare a suitable front lamp alignment screen.

1. Tape a line on a level floor 7.62 meters (25 feet) away from and parallel to the flat wall that will be used as the lamp alignment screen. The level floor will be used as the horizontal zero reference.
2. An adjacent wall or floor member that is perpendicular to the alignment screen can be used as the vertical zero reference. If there is no adjacent wall or floor member that is perpendicular to the screen, tape a second line on the floor perpendicular to both the alignment screen and the first line, and outboard of either side of where the vehicle will be positioned. This will be used as the vertical zero reference.
3. Position the vehicle so that the side of the vehicle is parallel to the vertical zero reference, and so that the front of the lamp lenses are in the vertical plane of the parallel line taped on the floor 7.62 meters (25 feet) away from the screen.
4. Rock the vehicle side-to-side three times to allow the suspension to stabilize.
5. Jounce the front suspension three times by pushing downward on the front bumper and releasing.
6. Measure the distance between the optical center of one of the lamps being aimed (head or fog) and the floor (horizontal zero reference). Transfer this measurement to the alignment screen with a piece of tape placed horizontally to the floor. This line will be used as the lamp horizontal reference.
7. Measure the distance between the vertical zero reference and the optical center of the nearest lamp being aimed (head or fog). Transfer this measurement to the alignment screen with a piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the center line reference for the first lamp.
8. Measure the distance on center between the first and the second lamp being aimed. Transfer this measurement to the alignment screen with a second piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the second lamp.

HEADLAMP ALIGNMENT

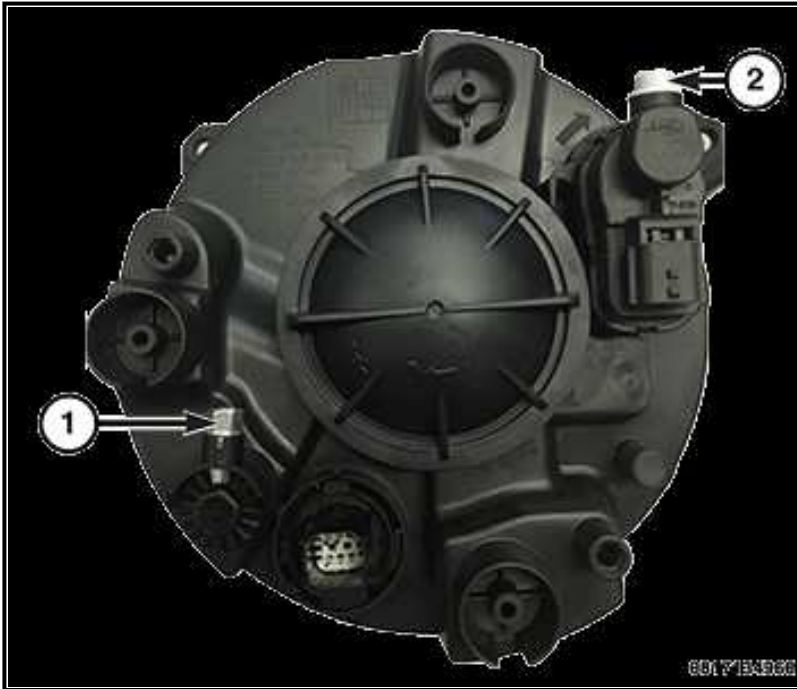
NOTE:

Due to the linear nature of the headlamp cutoff, a properly aimed low beam headlamp will project the top edge of the high intensity pattern on the alignment screen from the horizontal line to 50 millimeters (2 inches) below the horizontal line for domestic market vehicles, or to 125 millimeters (5 inches) below the horizontal line for export market vehicles. No horizontal (right/left) adjustment is required for this headlamp beam pattern in domestic market vehicles. Export market vehicles have a second horizontal (right/left)

adjustment screw provided. The high beam pattern will be correct when the low beams are properly aimed.

HALOGEN

1. Turn the headlamps ON and select the LOW beams for vehicles in all markets.

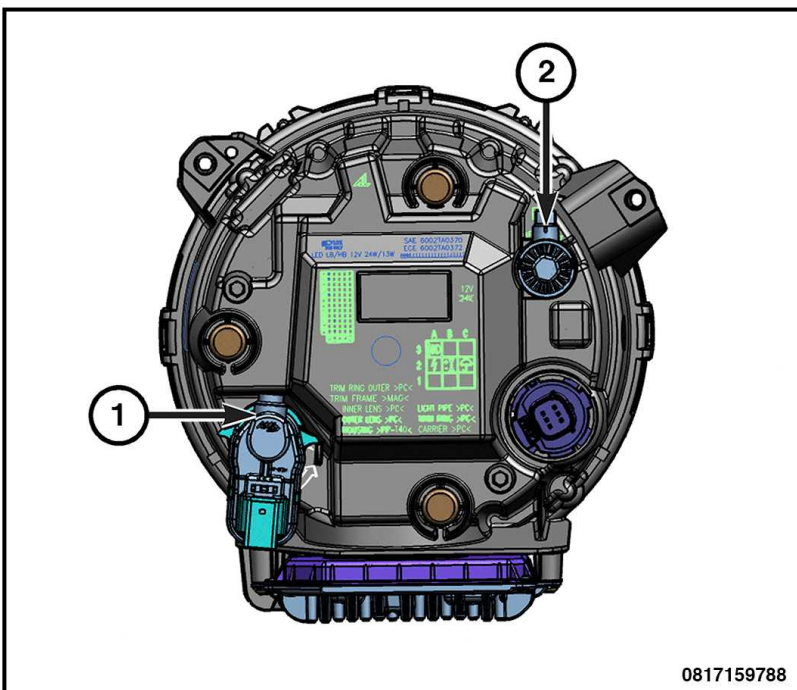


NOTE: Right side as shown in illustration, left side similar.

2. On all vehicles except those with headlamp leveling, use a screwdriver to rotate the headlamp vertical adjustment screw (2) on each headlamp to adjust the beam height as required.
3. For export markets only, use a screwdriver to rotate the headlamp horizontal adjustment screw (1) on each headlamp to adjust the beam right or left as required.

LED

1. Turn the headlamps ON and select the LOW beams for vehicles in all markets.

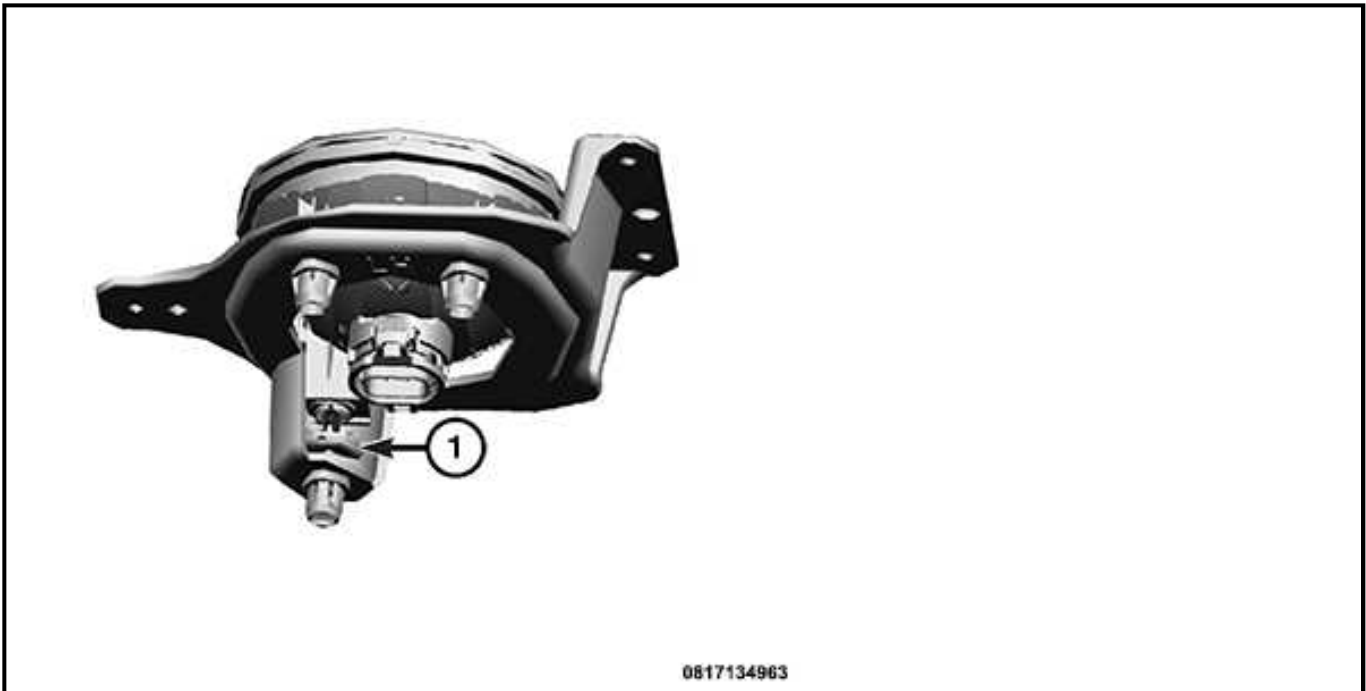
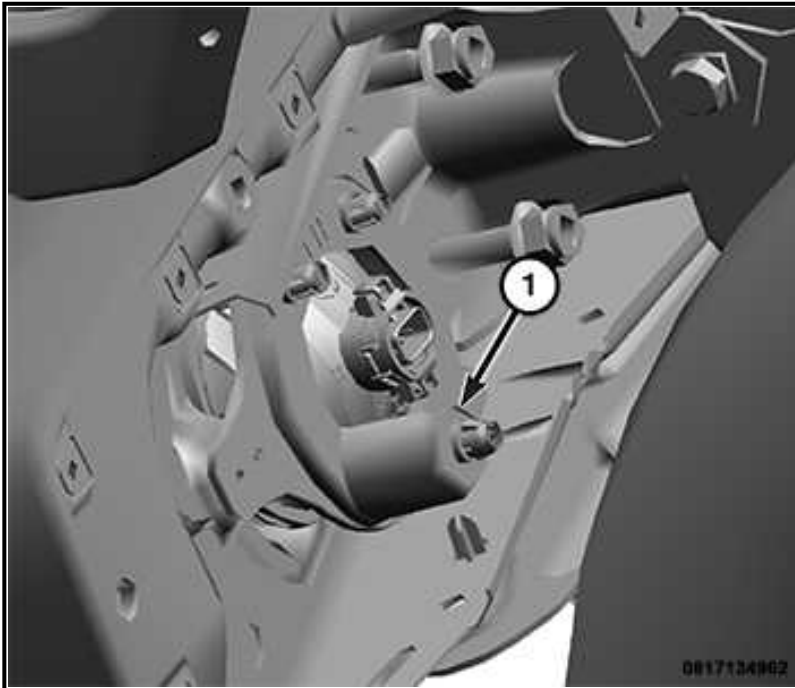


NOTE: Right side as shown in illustration, left side similar.

2. On all vehicles except those with headlamp leveling, use a screwdriver to rotate the headlamp vertical adjustment screw (2) on each headlamp to adjust the beam height as required.
3. For export markets only, use a screwdriver to rotate the headlamp horizontal adjustment screw (1) on each headlamp to adjust the beam right or left as required.

FOG LAMP ALIGNMENT

NOTE: A properly aimed front fog lamp will project a pattern on the alignment screen 100 millimeters (4 inches) below the fog lamp centerline and straight ahead of the lamp.



1. Turn the fog lamps ON.
2. Insert a screwdriver through the clearance hole in the underside of the front bumper (1) to rotate the vertical adjustment screw on each fog lamp to adjust the beam height as required.

TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	COMMENT
Fog Lamp bezel to Shell	5	-	44	Â
Fog Lamp to Mounting Bracket	8	-	71	Â
Rear Headlamp Sensor to Body	9	-	80	Â
Front Headlamp Sensor to Body	9	-	80	Â

CAM, TURN SIGNAL CANCEL

REMOVAL AND INSTALLATION

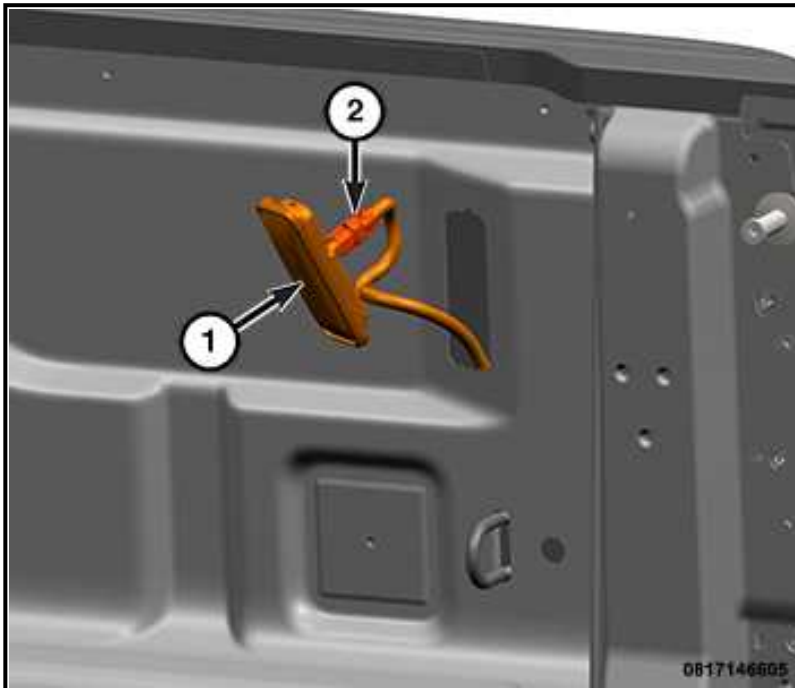
REMOVAL AND INSTALLATION

The turn signal cancel cam is located in the Steering Column Control Module (SCCM). The turn signal cancel cam cannot be adjusted or repaired. If the turn signal cancel cam is inoperative or damaged, the entire SCCM must be replaced. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .

LAMP, CARGO

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .
3. From under the cargo box, disconnect the wire harness connector (2) from the lamp (1).
4. Release the tabs securing the lamp (1) to the box and remove the lamp.

INSTALLATION

1. Position the lamp into the mounting hole in the box and seat the clips fully.

2. Connect the wire harness connector.
3. Remove the support and lower the vehicle.
4. Connect the negative battery cable(s). Refer to the appropriate service information .

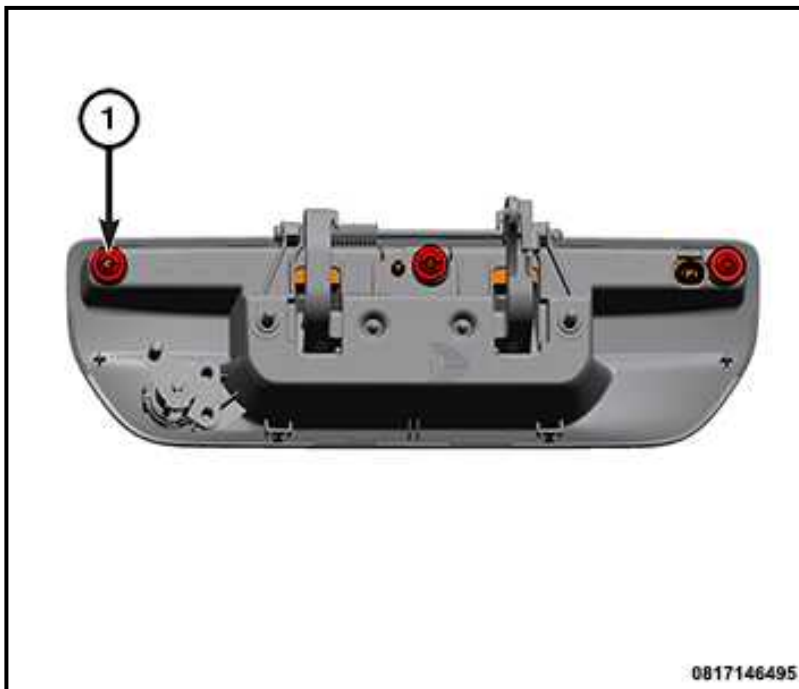
LAMP, CENTER HIGH MOUNTED STOP

REMOVAL AND INSTALLATION

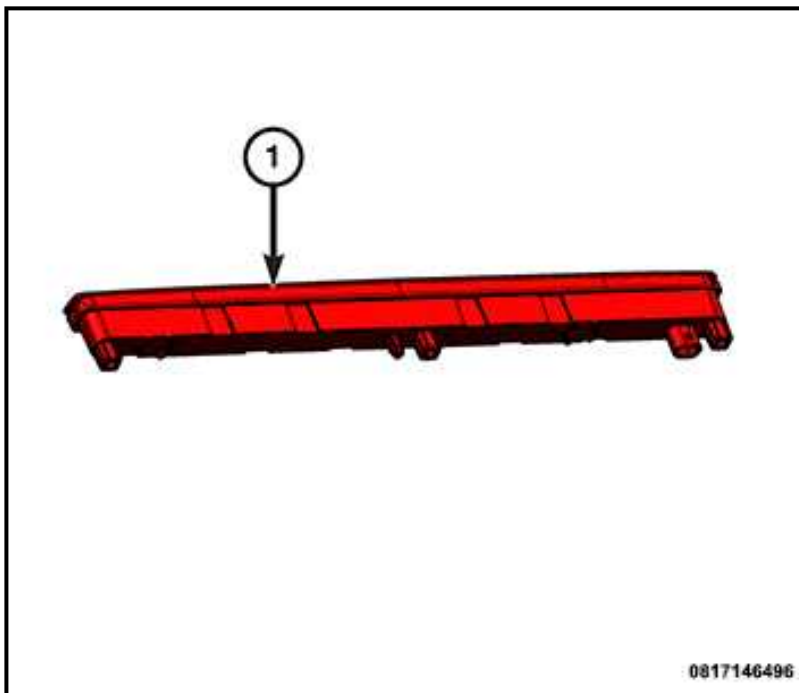
REMOVAL AND INSTALLATION

REMOVAL

1. Open the tailgate.
2. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
3. Remove the tailgate release handle. Refer to **HANDLE, LATCH RELEASE, REMOVAL AND INSTALLATION** .



4. Remove the three fasteners (1) securing the Center High Mounted Stop Lamp (CHMSL) to the tailgate handle.



5. Remove the rear CHMSL (1) from the tailgate handle.

INSTALLATION

1. Install the CHMSL into the tailgate handle and securely tighten the fasteners.
2. Install the tailgate release handle. Refer to [HANDLE, LATCH RELEASE, REMOVAL AND INSTALLATION](#) .
3. Close the tailgate.
4. Connect the negative battery cable(s). Refer to the appropriate service information .

LAMP, FOG

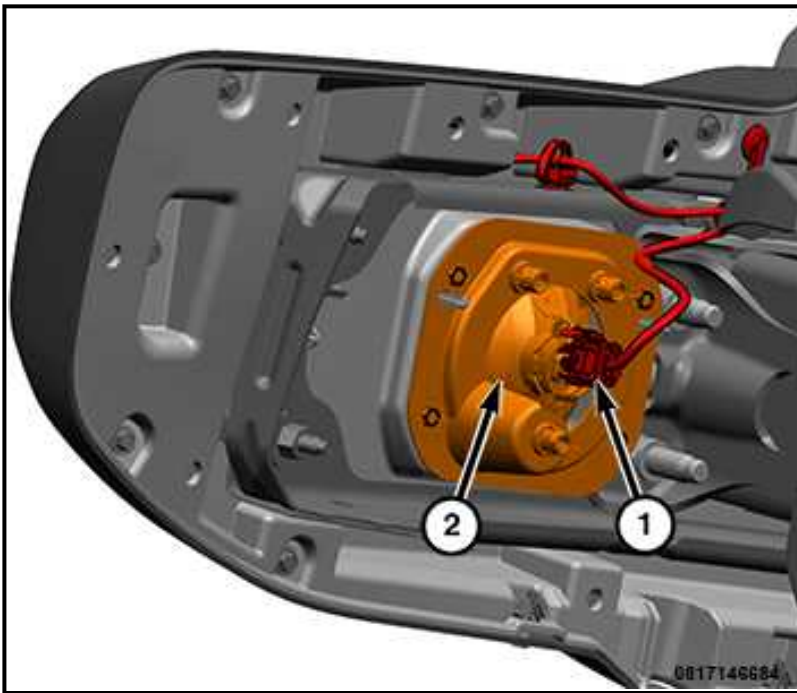
REMOVAL AND INSTALLATION

BULB

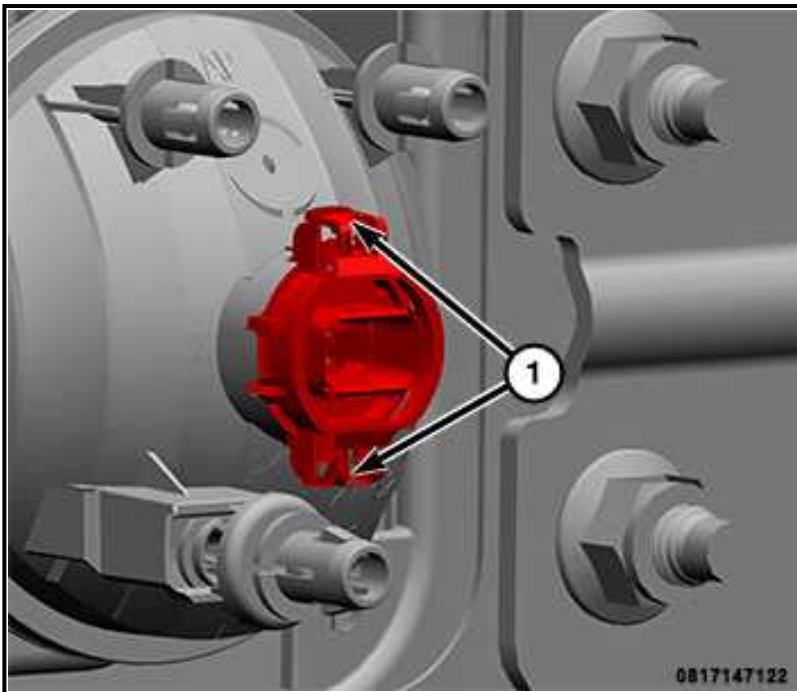
REMOVAL

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (1) from the front fog lamp assembly (2).



4. Disengage tabs (1) then pull the bulb straight out from the housing.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket or the lamp wiring.

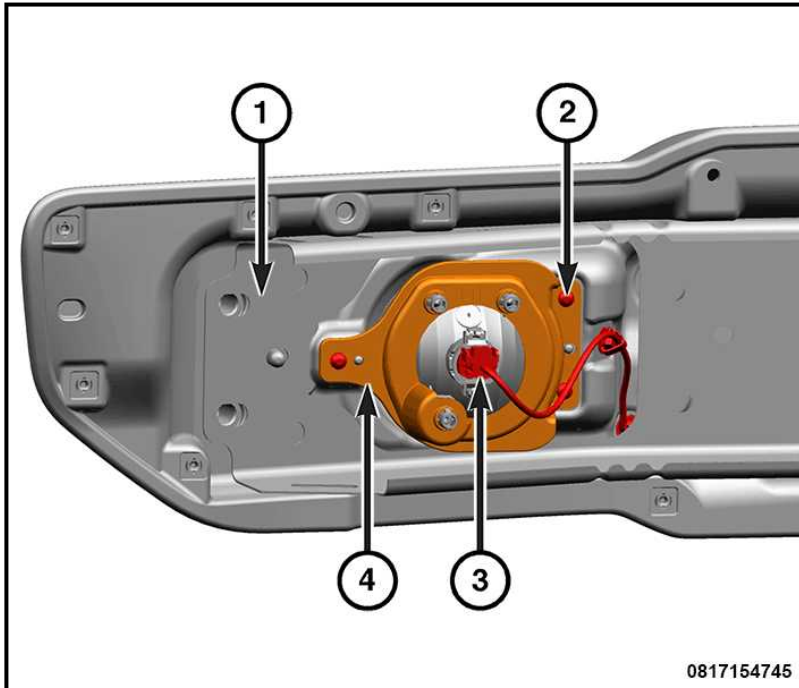
CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

1. Install the bulb into the housing and verify the tabs are fully engaged.
2. Connect the wire harness connector to the fog lamp assembly.
3. Install the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

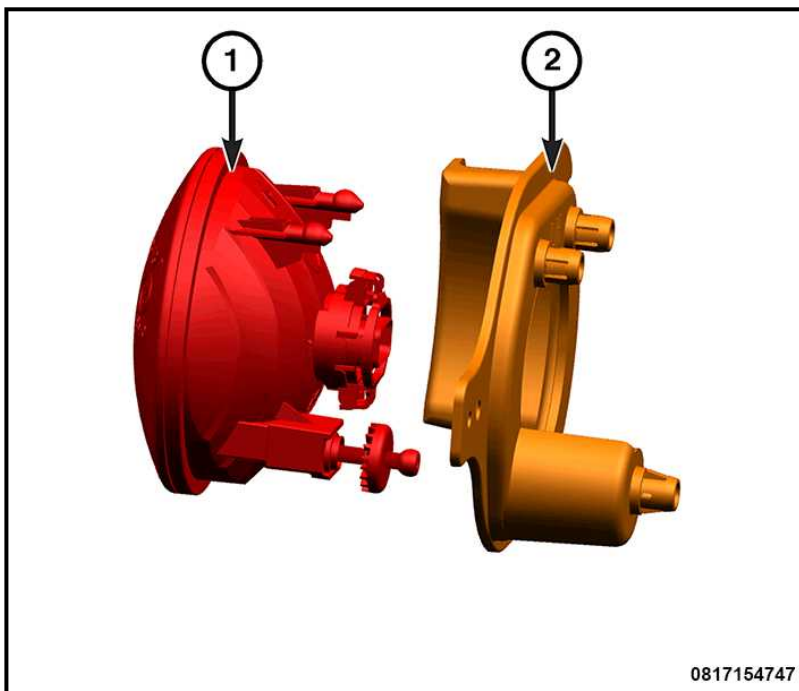
BASE LAMP

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (3) from the front fog lamp assembly.
4. Remove the three screws (2) that secure the front fog lamp assembly to the back of the front bumper (1).
5. Remove the front fog lamp assembly from the back of the front bumper.



6. Separate the fog lamp (1) from the fog lamp bracket (2).

INSTALLATION

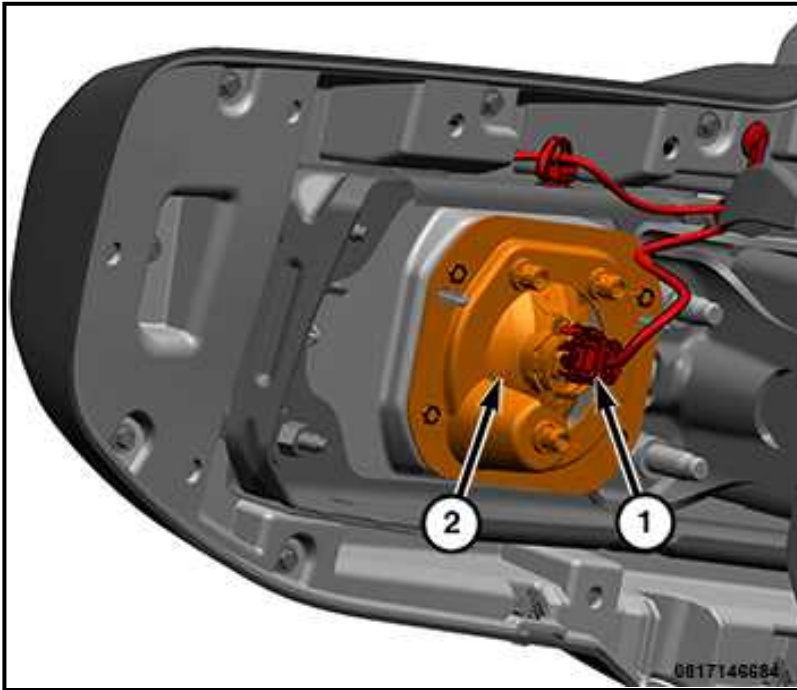
1. Install fog lamp to the fog lamp bracket, press together until the locking tabs are fully seated.
2. Position the front fog lamp assembly to the back of the front bumper. Be certain that the two alignment pins on the back of the front bumper cover are engaged in the alignment holes in the lamp housing.

3. Install the three fasteners that secure the front fog lamp assembly to the back of the front bumper. Tighten the screws to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
4. Connect the wire harness connector to the fog lamp assembly.
5. Install the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .
6. Connect the negative battery cable(s). Refer to the appropriate service information .

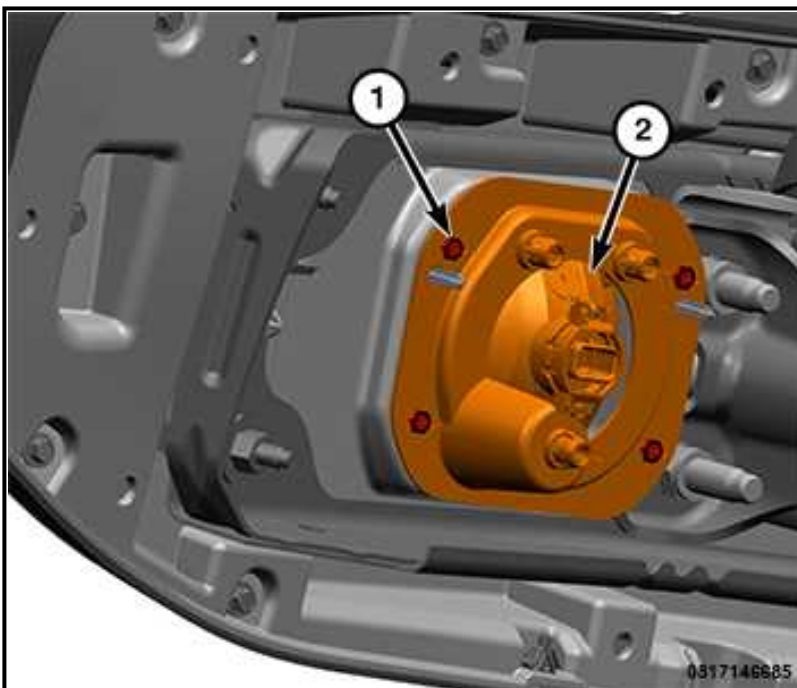
PREMIUM LAMP WITH BULB

REMOVAL

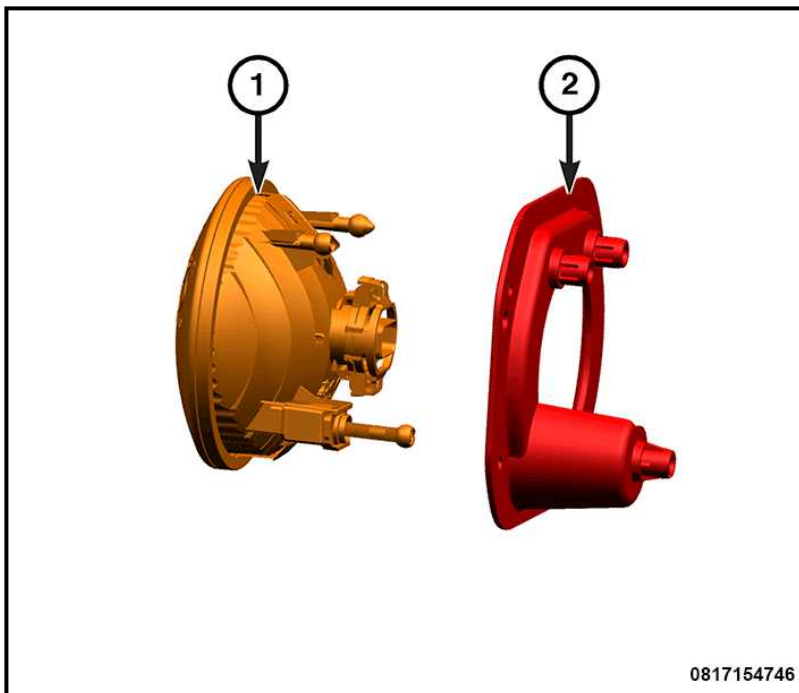
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (1) from the front fog lamp assembly (2).



4. Remove the four screws (1) that secure the front fog lamp assembly to the back of the front bumper.
5. Remove the front fog lamp assembly (2) from the back of the front bumper.



6. Separate the fog lamp (1) from the fog lamp bracket (2).

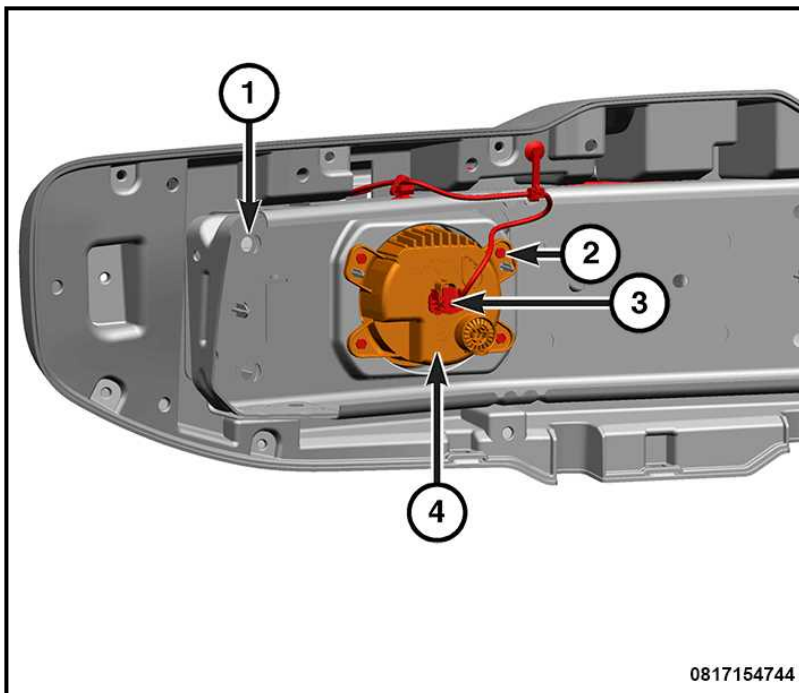
INSTALLATION

1. Install fog lamp to the fog lamp bracket, press together until the locking tabs are fully seated.
2. Position the front fog lamp assembly to the back of the front bumper. Be certain that the two alignment pins on the back of the front bumper cover are engaged in the alignment holes in the lamp housing.
3. Install the four fasteners that secure the front fog lamp assembly to the back of the front bumper. Tighten the screws to the proper. Refer to [TORQUE SPECIFICATIONS](#) .
4. Connect the wire harness connector to the fog lamp assembly.
5. Install the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .
6. Connect the negative battery cable(s). Refer to the appropriate service information .

PREMIUM LAMP WITH LED

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (3) from the front fog lamp assembly (4).
4. Remove the four screws (2) that secure the front fog lamp assembly to the back of the front bumper (1).
5. Remove the front fog lamp assembly (4) from the back of the front bumper (1).

INSTALLATION

1. Position the front fog lamp assembly to the back of the front bumper. Be certain that the two alignment pins on the back of the front bumper cover are engaged in the alignment holes in the lamp housing.
2. Install the four screws that secure the front fog lamp assembly to the back of the front bumper. Tighten the screws to proper. Refer to [TORQUE SPECIFICATIONS](#).
3. Connect the wire harness connector to the fog lamp assembly.
4. Install the closeout cover. Refer to [COVER, CLOSEOUT, REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to the appropriate service information.

LAMP, LICENSE PLATE

REMOVAL AND INSTALLATION

BULB - DOMESTIC

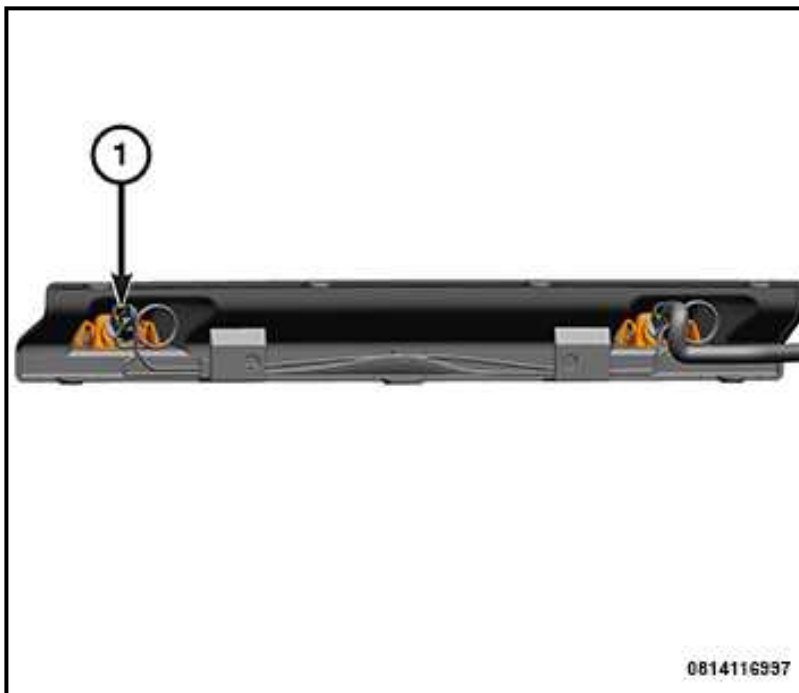
REMOVAL AND INSTALLATION

The license plate bulb is integrated in the license plate lamp assembly. The license plate lamp cannot be adjusted or repaired. If the bulb is inoperative or damaged, the license plate lamp must be replaced. Refer to [LAMP, LICENSE PLATE, REMOVAL AND INSTALLATION](#).

BULB - EXPORT

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information.
2. Remove the license plate lamp assembly from the vehicle. Refer to [LAMP, LICENSE PLATE, REMOVAL AND INSTALLATION](#).



3. Disconnect the wire harness connector from the lamp (1).
4. Remove the bulb from the connector.

INSTALLATION

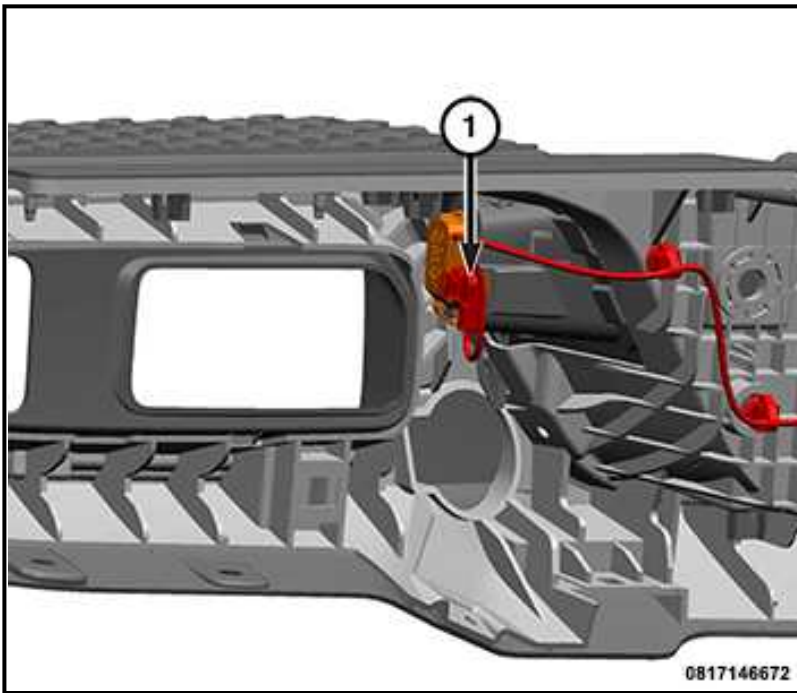
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket or the lamp wiring.

1. Align the base of the bulb with the license plate lamp socket.
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of the license plate lamp lens.
4. Install the license plate assembly back in to the vehicle Refer to [LAMP, LICENSE PLATE, REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to the appropriate service information .

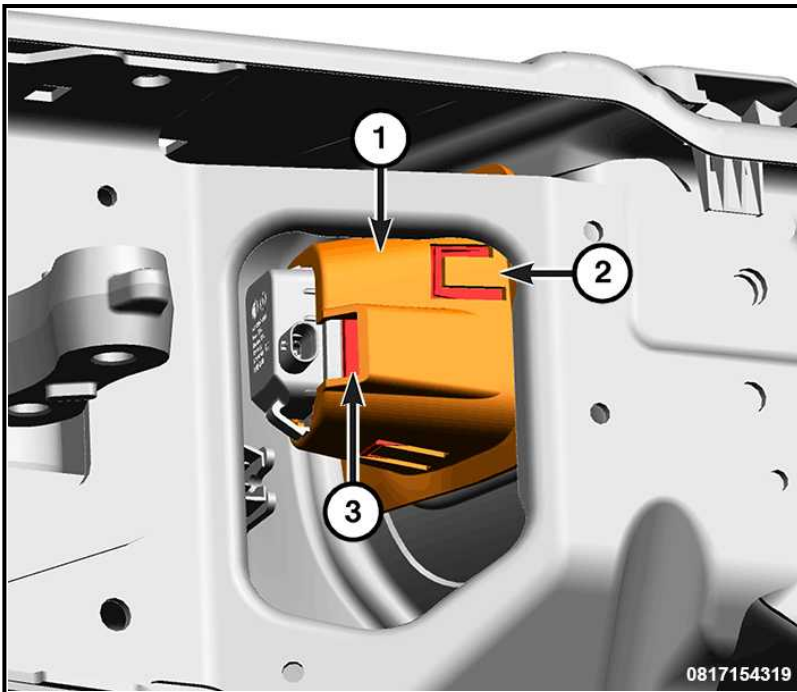
LAMP - DOMESTIC

REMOVAL

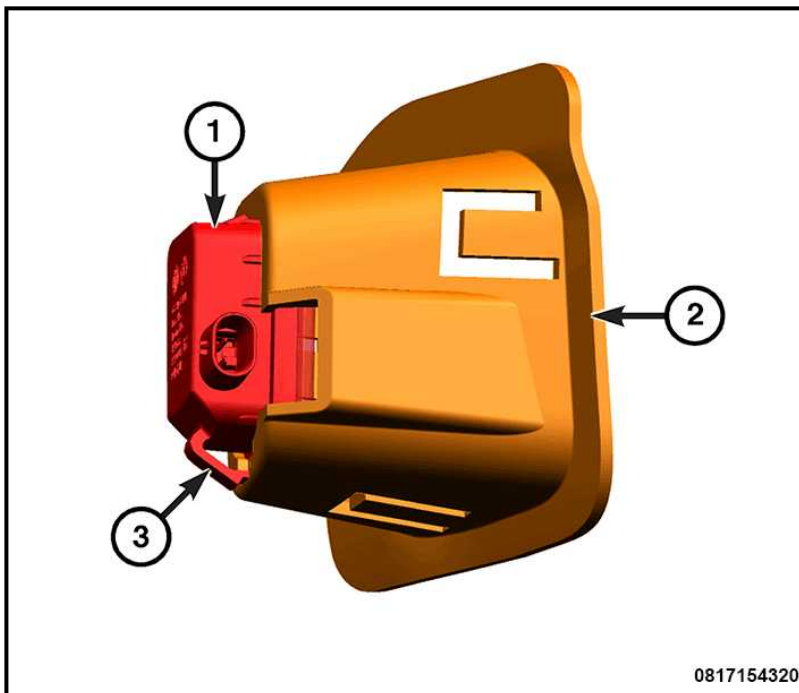
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the rear bumper. Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (1) from the license plate lamp unit.



4. Working from the back side of the rear bumper use a trim stick to release the retaining tabs (2) and remove the license plate lamp bezel (3) from the front side of the bumper.



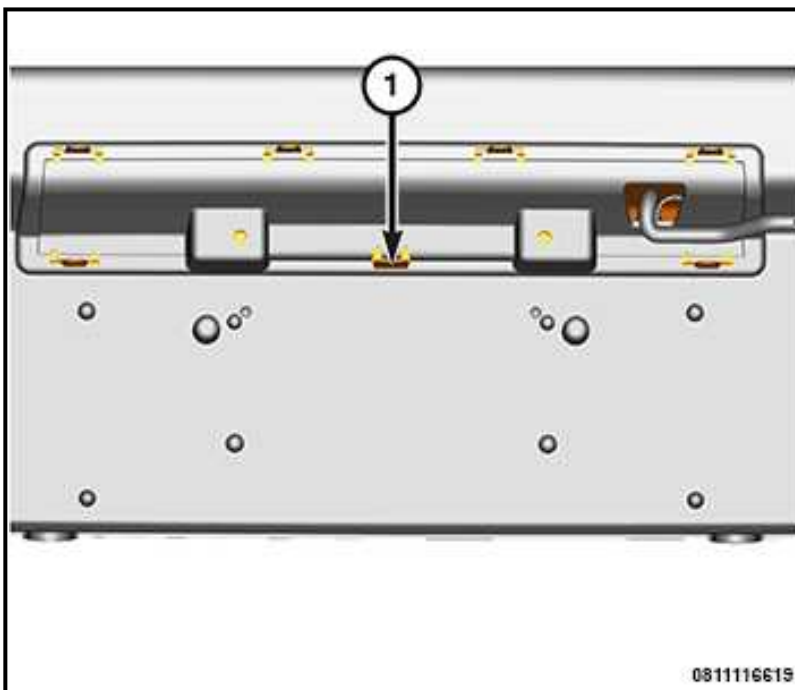
5. Release the retaining tab (3) and remove the license plate lamp (1) from the retaining bezel (2).

INSTALLATION

1. Position the license plate lamp into the retaining bezel and fully seat the retaining tab.
2. Install the license plate lamp, retaining bezel on the back side of the rear bumper, then install the license plate trim bezel from the front side into the retaining bezel and fully seat the retaining tabs.
3. Connect the wire harness connector on the license plate lamp unit.
4. Install the rear bumper. Refer to [BUMPER, REAR, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

LAMP - EXPORT

REMOVAL



1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Reach under and behind the rear bumper to access and disconnect the license plate lamp pigtail wire harness connector from the body wire harness.

3. Remove the license plate from the rear bumper cover.
4. Pull the license plate lamp unit away from the rear bumper cover far enough to disengage the pigtail wire harness from the clearance hole.
5. Remove the bracket and lamp unit (1) from the rear bumper cover.

INSTALLATION

1. Position the rear license plate lamp unit to the rear fascia.
2. Insert the license plate lamp pigtail wire harness and connector through the clearance hole in the rear bumper cover.
3. Align the mounting holes of the license plate lamp unit to the mounting holes in the rear bumper cover.
4. Install the license plate onto the rear bumper cover.
5. Reach under and behind the rear bumper to reconnect the license plate lamp pigtail wire harness connector to the body wire harness.
6. Connect the negative battery cable(s). Refer to the appropriate service information .

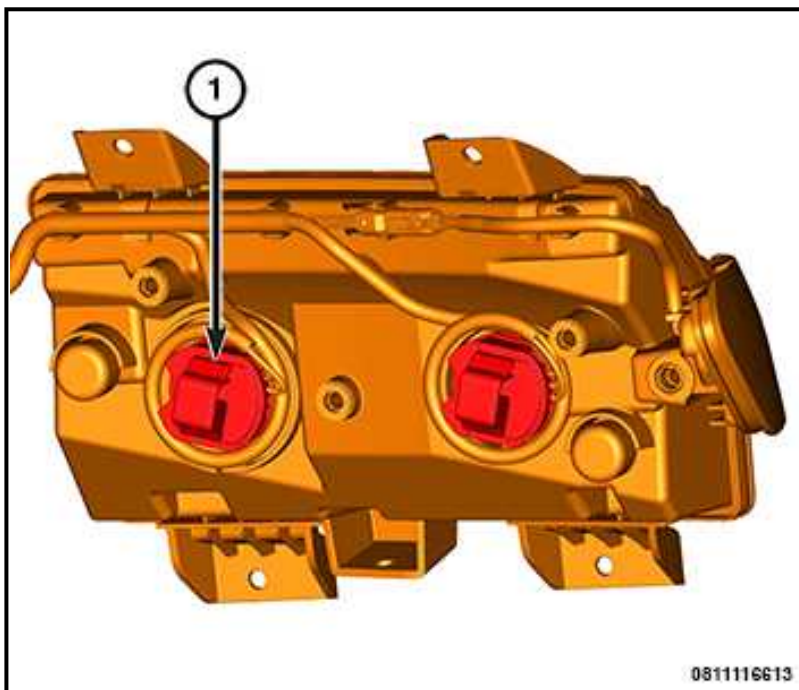
LAMP, PARK AND TURN SIGNAL

REMOVAL AND INSTALLATION

BULB

BULB - REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the inner wheel well to gain access to the inside of the lamp fixture. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) [SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION](#) .



3. Firmly grasp the bulb socket (1) on the back of the lamp housing and rotate it counterclockwise about 30 degrees to unlock it.
4. Pull the socket and bulb straight out from the keyed opening in the housing.
5. Pull the base of the bulb straight out of the socket.

BULB - INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket or the lamp wiring.

1. Align the base of the bulb with the park/turn signal lamp socket.
2. Push the bulb straight into the socket until the base is firmly seated.
3. Insert the socket and bulb into the housing until the socket is firmly seated.
4. Rotate the socket clockwise about 30 degrees to lock it into place.
5. Reconnect the wire harness connector to the bulb socket connector receptacle.
6. Connect the negative battery cable(s). Refer to the appropriate service information .

CENTER LAMP

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the inner wheel well to gain access to the inside of the lamp fixture. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) [SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION](#) .
3. Remove the flare molding, Refer to [MOLDING, FRONT WHEEL OPENING, REMOVAL AND INSTALLATION](#) [MOLDING, REAR WHEEL OPENING, REMOVAL AND INSTALLATION](#) .



4. Swing the access door out of the way to gain access to the bolts for the brace and lamp.
5. Remove the retaining bolts (1) from the mounting brace.
6. Remove the wire harness retainers from the inner fender.



7. Remove the bolts (1) from the lamp.
8. Remove the lamp from the vehicle.

INSTALLATION

1. Position the park/turn signal lamp back in to the front of the fender.
2. Reconnect the wire harness connector to the lamp bulb socket connector receptacle.
3. Install lamp screws.
4. Install the lamp brace and the lamp brace screws.
5. Install the fender flare. Refer to [FENDER, FRONT, REMOVAL AND INSTALLATION](#) .
6. Install the inner wheel well. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) [SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION](#) .
7. Connect the negative battery cable(s). Refer to the appropriate service information .

LAMP, SIDE REPEATER

REMOVAL AND INSTALLATION

BULB

REMOVAL AND INSTALLATION

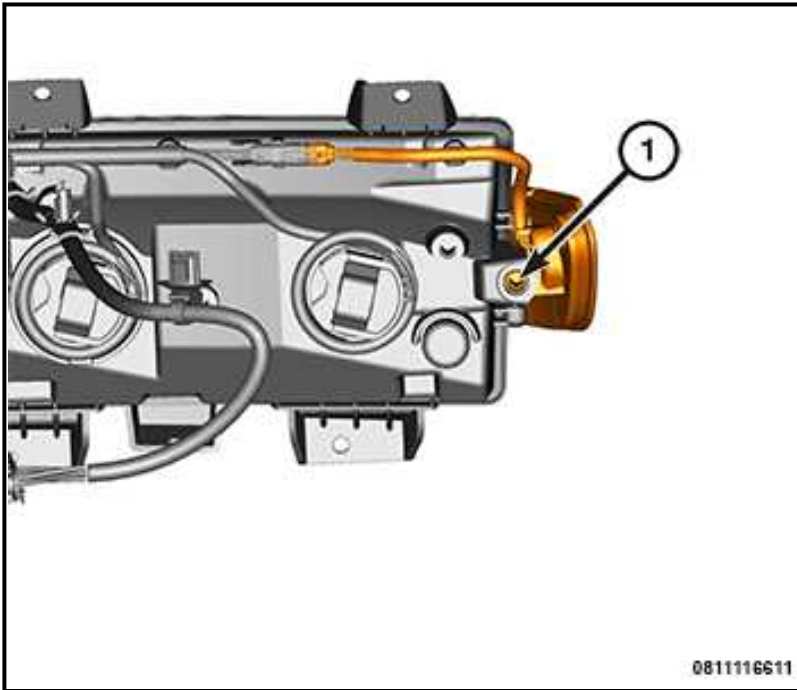
The side repeater bulb is part of the lamp housing and cannot be replaced or adjusted. If the lamp is inoperative or damaged, it must be replaced. For removal of the lamp Refer to [LAMP, SIDE REPEATER, REMOVAL AND INSTALLATION](#).

CENTER LAMP

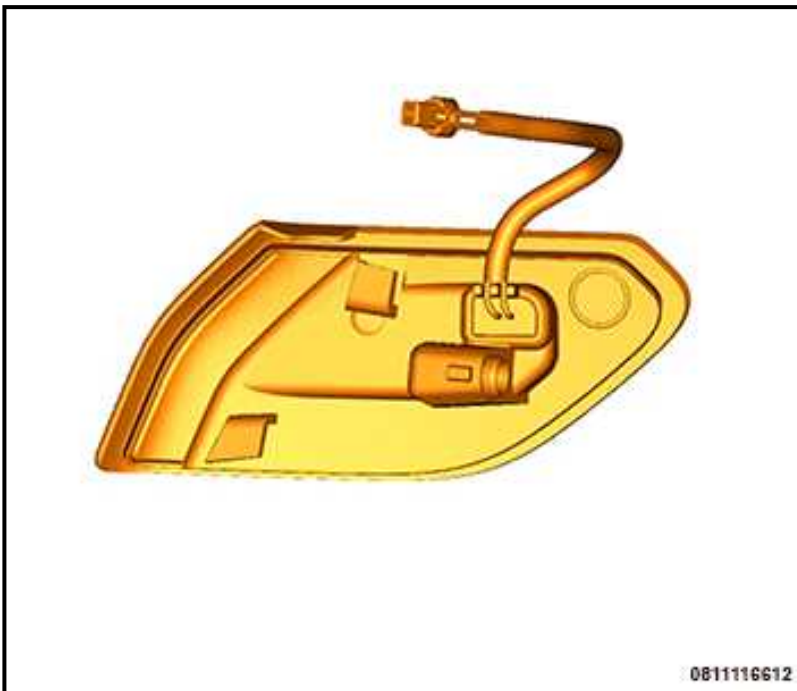
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle. Refer to [HOISTING, STANDARD PROCEDURE](#) .
3. Remove the inner fender well. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) [SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION](#) .

4. Remove the turn signal park lamp. Refer to [LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION](#).



5. Remove the retaining screw (1) from the from marker and disconnect the wire harness connector.



6. Remove the side repeater lamp from the front marker lamp.

INSTALLATION

1. Install the side repeater lamp back in to the front maker lamp and tighten the retaining screw securely.
2. Install the front maker lamp back in to the vehicle. Refer to [LAMP, PARK AND TURN SIGNAL, REMOVAL AND INSTALLATION](#).
3. Install the inner fender well. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) [SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION](#) .
4. Remove the support and lower the vehicle.
5. Connect the negative battery cable(s). Refer to the appropriate service information .

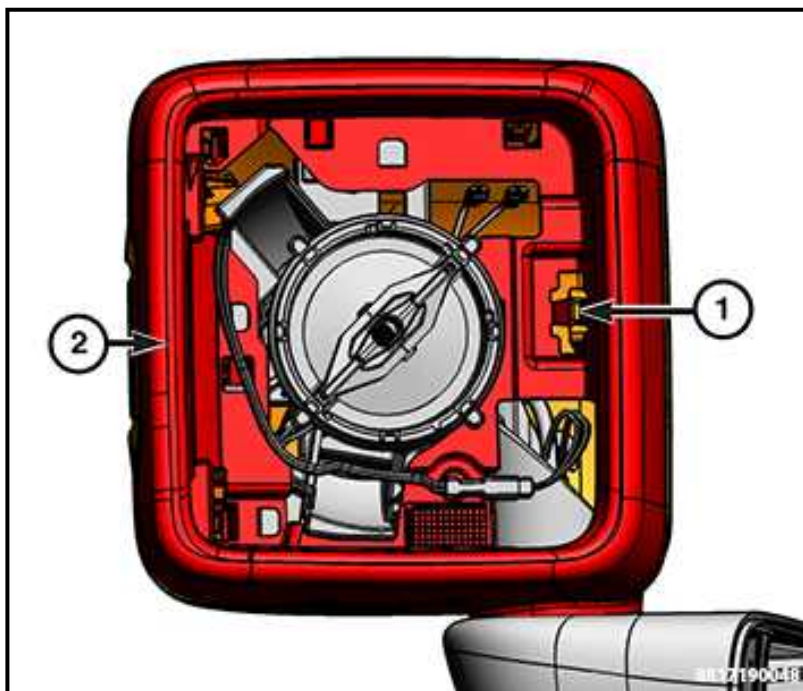
LAMP, MIRROR

REMOVAL AND INSTALLATION

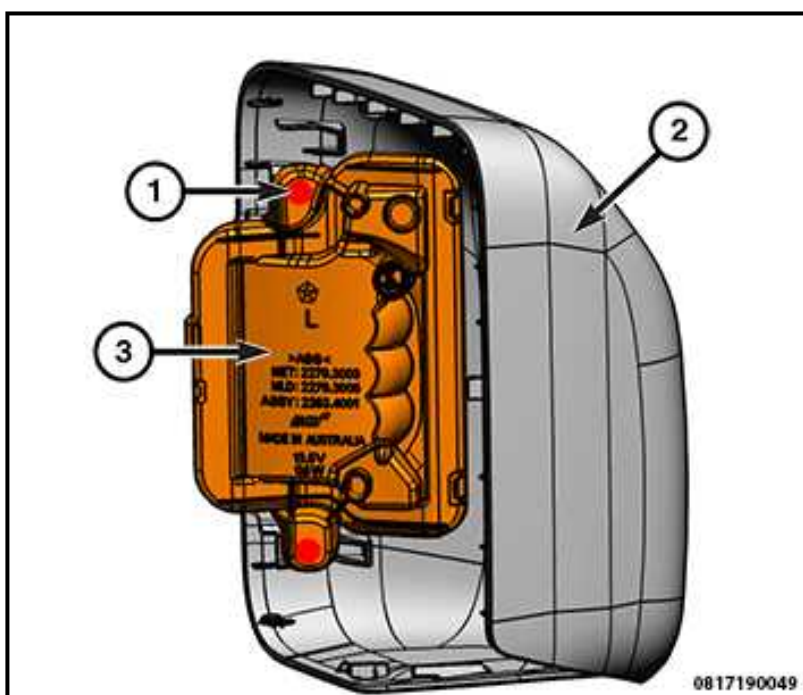
REMOVAL AND INSTALLATION

REMOVAL

1. Remove the outside rearview mirror glass. Refer to [MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION](#) [MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION](#) .



2. Disengage the clips (1) on the mirror cap from the outside rearview mirror (2).
3. Disconnect the wire harness connector from the mirror lamp and remove the mirror cap and lamp from the vehicle assembly.



4. Remove the fasteners (1) that secure the mirror lamp (3) to the mirror cap (2).

INSTALLATION

1. Position the mirror lamp to the mirror cap, then install the fasteners and tighten securely.
2. Connect the wire harness connector to the mirror lamp.
3. Position the mirror cap assembly to the outside rearview mirror, then seat the mirror cap clips fully.

LAMP, TAIL STOP TURN

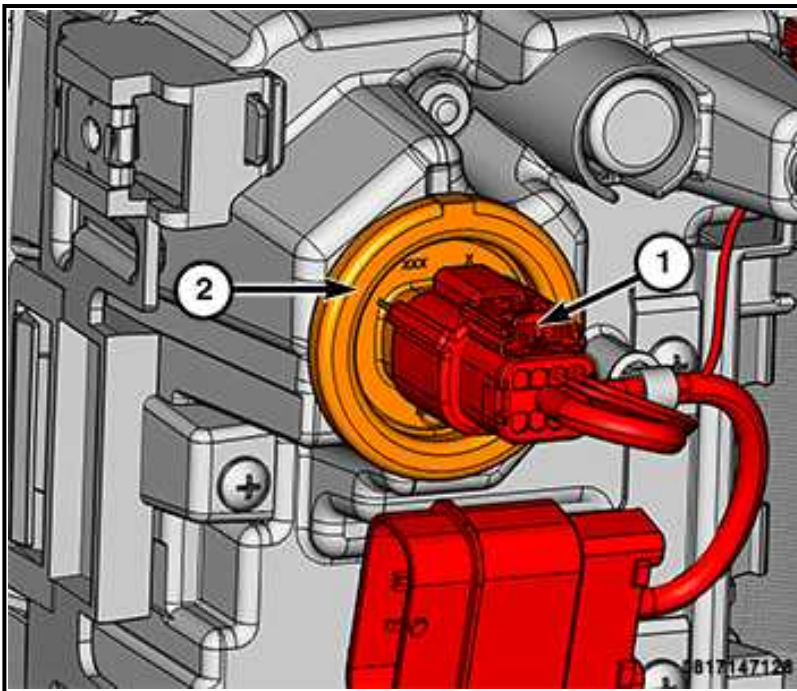
REMOVAL AND INSTALLATION

BULB

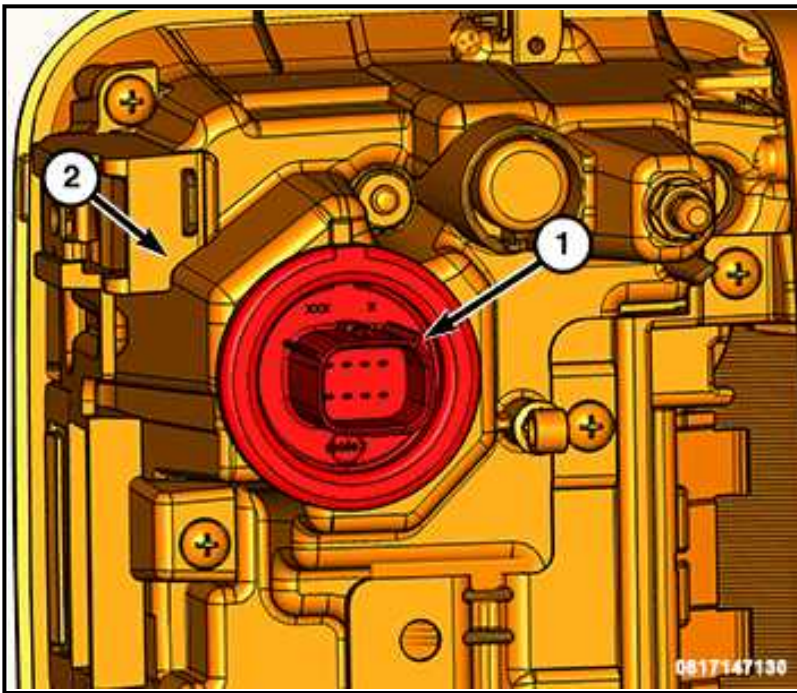
REMOVAL

NOTE: For vehicles equipped with LED tail lamp units, the LED is not serviceable separately. Refer to UNIT, HEADLAMP, REMOVAL AND INSTALLATION.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the tail lamp assembly. Refer to LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION.



3. Disconnect the wire harness connector (1) from the bulb socket (2).



4. Rotate the bulb socket counterclockwise about 30 degrees to unlock it.
5. Pull the socket and bulb straight out from the keyed opening in the tail lamp assembly.
6. Pull the base of the bulb straight out of the socket.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket or the lamp wiring.

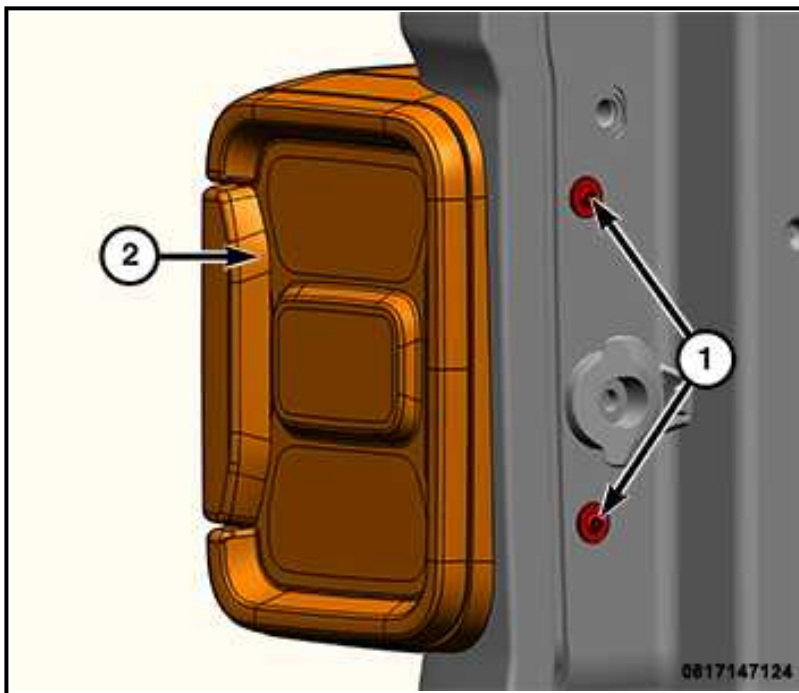
1. Align the base of the bulb with the bulb socket.
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of the tail lamp assembly.
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place.
6. Install the tail lamp assembly. Refer to [LAMP, TAIL STOP TURN, REMOVAL AND INSTALLATION](#).
7. Connect the negative battery cable(s). Refer to the appropriate service information .

CENTER LAMP

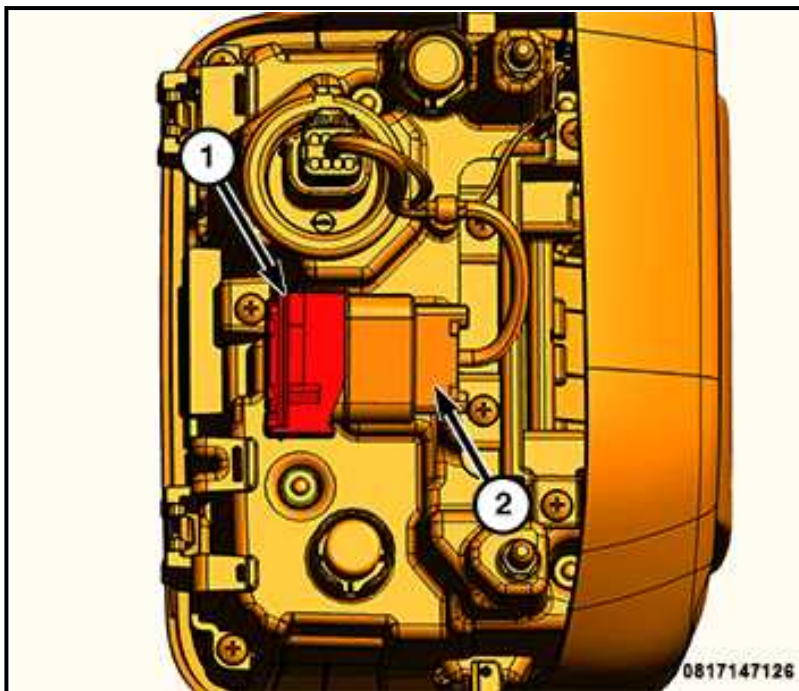
REMOVAL

NOTE: For vehicles equipped with LED tail lamp units, the LED is not serviceable separately. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Open the tailgate.



3. Remove the two bolts (1) from the tail lamp assembly (2).
4. Pull the tail lamp assembly from the mounting stud on the body.



5. Disconnect the wire harness connector (1) from the tail lamp assembly (2).
6. Remove the tail lamp assembly from the vehicle.

INSTALLATION

1. Connect the wire harness connector to the tail lamp assembly.
2. Install the tail lamp assembly in the body.
3. Install the two bolts.
4. Close the tailgate.
5. Connect the negative battery cable(s). Refer to the appropriate service information .

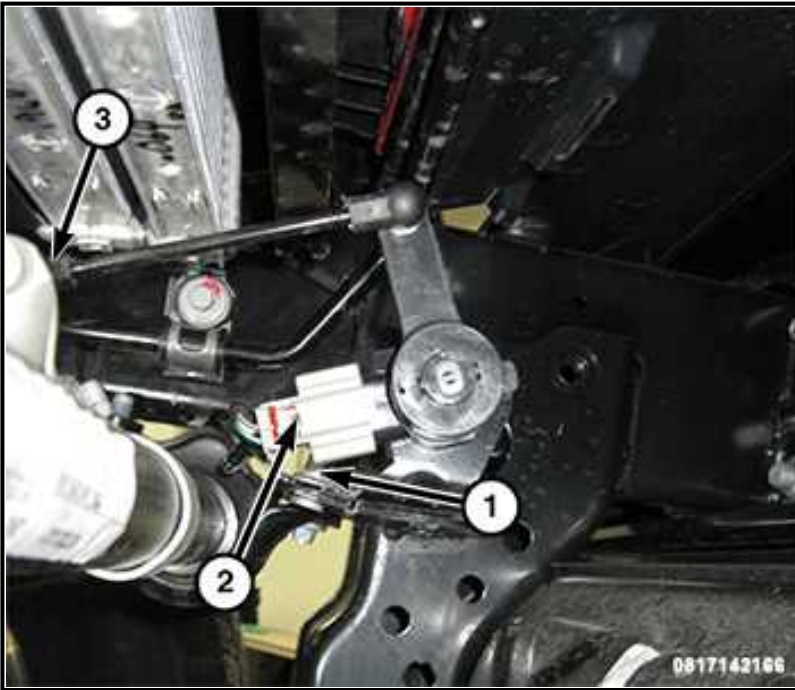
SENSOR, AXLE

REMOVAL AND INSTALLATION

FRONT

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the front air dam. Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION](#) .
3. Locate the front axle sensor from within the right front fender wheel house.



4. Disconnect the actuator rod (3).
5. Remove the nut (1) and separate the sensor from the bracket.
6. Disconnect the wire harness connector (2) from the axle sensor.

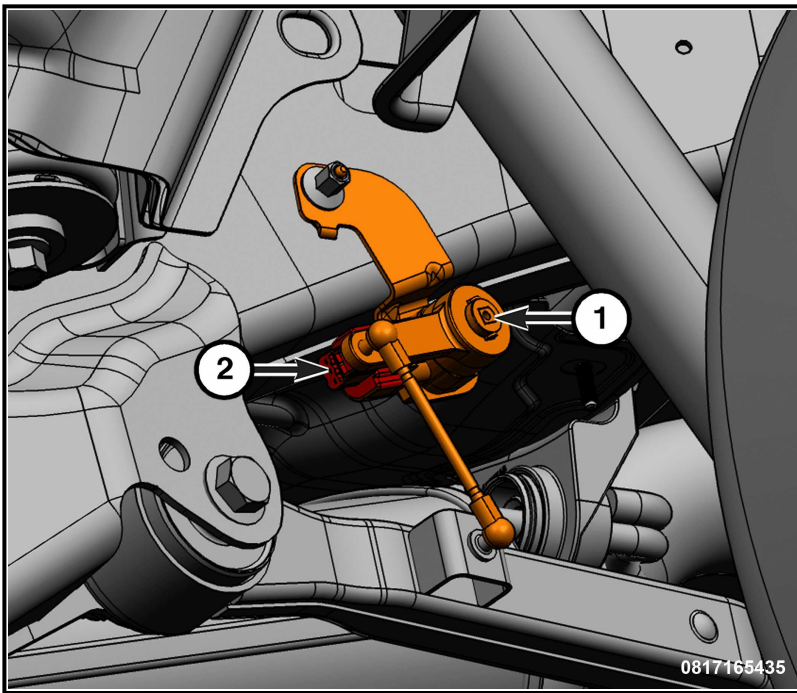
INSTALLATION

1. Connect the wire harness connector for the axle sensor.
2. Install the sensor onto the bracket and install the nut securely.
3. Seat the actuator rod onto the ball stud fully.
4. Install the front air dam. Refer to [AIR DAM, FRONT, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

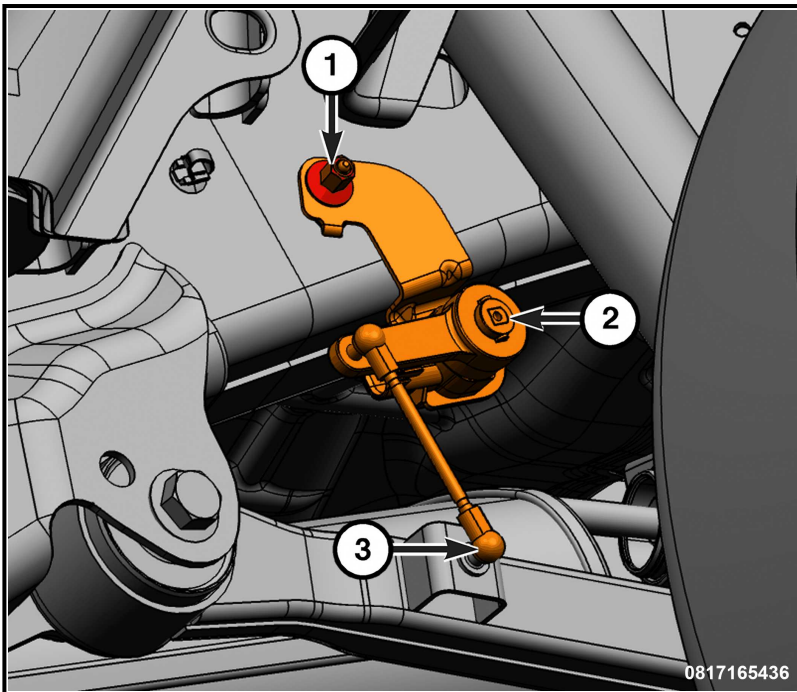
REAR

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle, Refer to [HOISTING, STANDARD PROCEDURE](#) .
3. Locate the rear sensor on the frame forward of the rear wheel.



4. Disconnect the wire harness connector (2) from the sensor (1).



5. Release the actuator rod (3).

6. Remove the nut (1) and remove the sensor (2).

INSTALLATION

1. Install the sensor to the frame and install the nut and tighten securely.
2. Seat the actuator rod to the ball stud fully.
3. Connect the wire harness connector.
4. Remove the support and lower the vehicle.
5. Connect the negative battery cable(s). Refer to the appropriate service information .

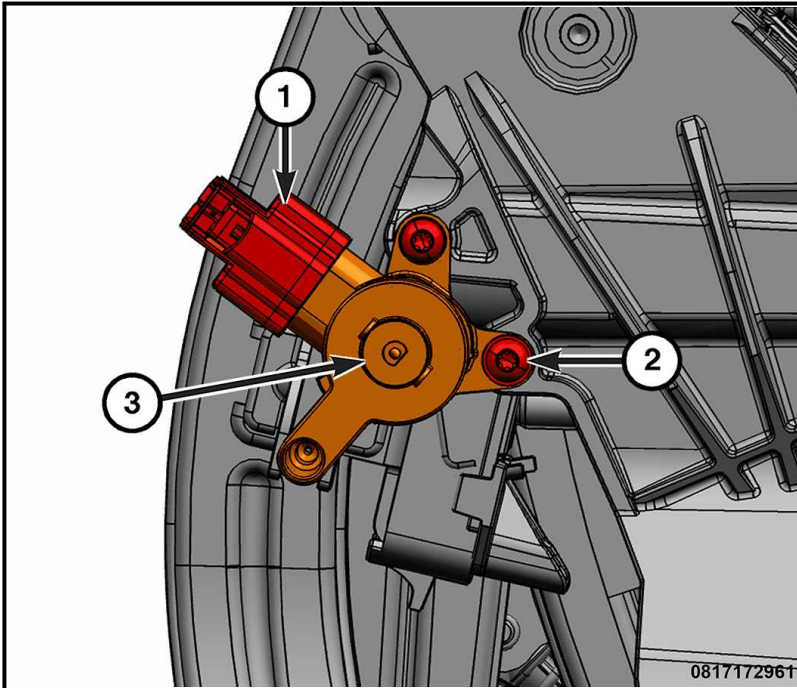
SENSOR, STOP LAMP

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



2. Locate the brake lamp sensor (3) on the brake pedal support bracket under the instrument panel.
3. Disconnect the wire harness connector (1) from the brake lamp sensor (3).
4. Remove the fasteners (2) from the sensor (3) and the bracket.
5. Pull the sensor (3) straight away from the keyed hole to remove it from the bracket.
6. Remove the brake pedal sensor (3) from the vehicle.

INSTALLATION

1. Install the brake pedal sensor in the bracket.
2. Install the fasteners and tighten securely.
3. Connect the wire harness connector to the connector receptacle on the sensor.
4. Connect the negative battery cable(s). Refer to the appropriate service information .

PERFORM THE BRAKE PEDAL CALIBRATION ROUTINE

1. Park the vehicle on level ground.

NOTE: When performing the Brake Pedal Calibration routine, make sure the brake pedal is NOT pressed.

2. With the scan tool, under "Miscellaneous Functions" run the Brake Pedal Calibration routine.

SWITCH, FOG LAMP

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The fog lamp switch is located in the head lamp switch. The fog lamp switch cannot be adjusted or repaired. If the fog lamp switch or indicator lamp are inoperative or damaged, the head lamp switch must be replaced. Refer to **SWITCH, HEADLAMP, REMOVAL AND INSTALLATION**.

SWITCH, HAZARD WARNING

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The hazard switch is located in the Integrated Center Stack (ICS) module. ICS cannot be adjusted or repaired. If hazard switch or indicator lamp are inoperative or damaged, the entire ICS must be replaced. Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND INSTALLATION](#) .

SWITCH, HEADLAMP LEVELING

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The head lamp leveling switch is part of the head lamp switch. The head lamp switch cannot be adjusted or repaired. Refer to [SWITCH, HEADLAMP, REMOVAL AND INSTALLATION](#).

SWITCH, HEADLAMP

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION



REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the driver side instrument panel cover, Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .
3. Using a trim stick or equivalent tool, release the four tabs (1) that secure the head lamp switch (2) to the cover.
4. Remove the head lamp switch from the cover.

INSTALLATION

1. Snap the head lamp switch (2) into the instrument panel cover confirming that all four retainers (1) are seated fully.

2. Install the driver side instrument panel cover, Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .
3. Connect the negative battery cable(s). Refer to the appropriate service information .
4. Test the operation of the head lamp switch.

SWITCH, PARKING BRAKE

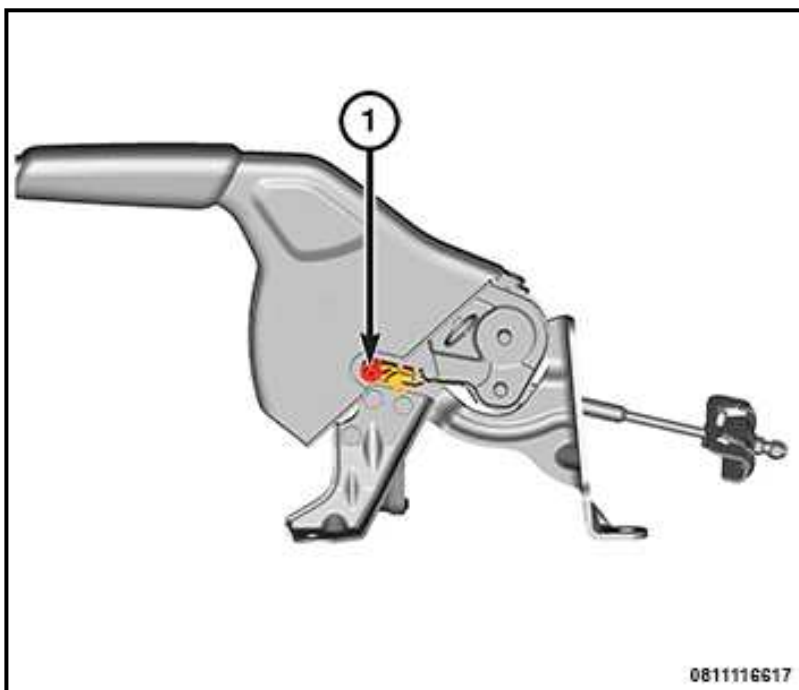
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the console from the floor panel transmission tunnel, Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .
3. Pull the parking brake lever upward to apply the parking brake.
4. Disconnect the wire harness connector from the terminal of the park brake switch located on the outboard side of the park brake lever mechanism.



5. Remove the screw (1) that secures the switch to the park brake lever bracket.
6. Remove the switch from the park brake lever bracket.

INSTALLATION

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel,

steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position park brake switch onto the inboard side of the park brake lever bracket. Be certain to engage the locating pin on the side of the switch insulator into the locating slot in the lever bracket.
2. Install and tighten the screw that secures the switch to the lever bracket.
3. Reconnect the instrument panel wire harness connector to the terminal of the switch.
4. Install the console onto the floor panel transmission tunnel, Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .
6. Turn the ignition switch to the ON position and check for proper brake indicator operation with the parking brake applied, then release the parking brake and check that the brake indicator extinguishes.

UNIT, HEADLAMP

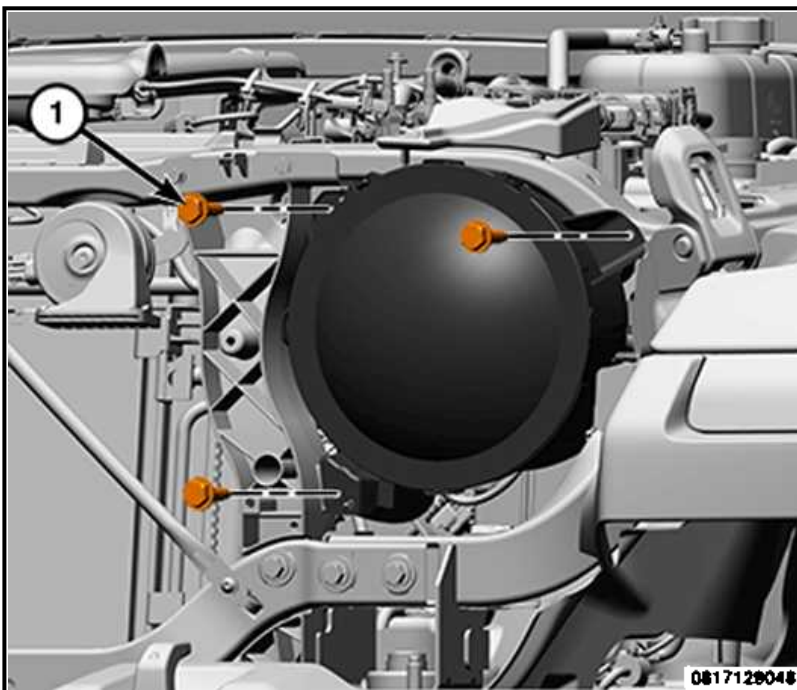
REMOVAL AND INSTALLATION

HEADLAMP UNIT

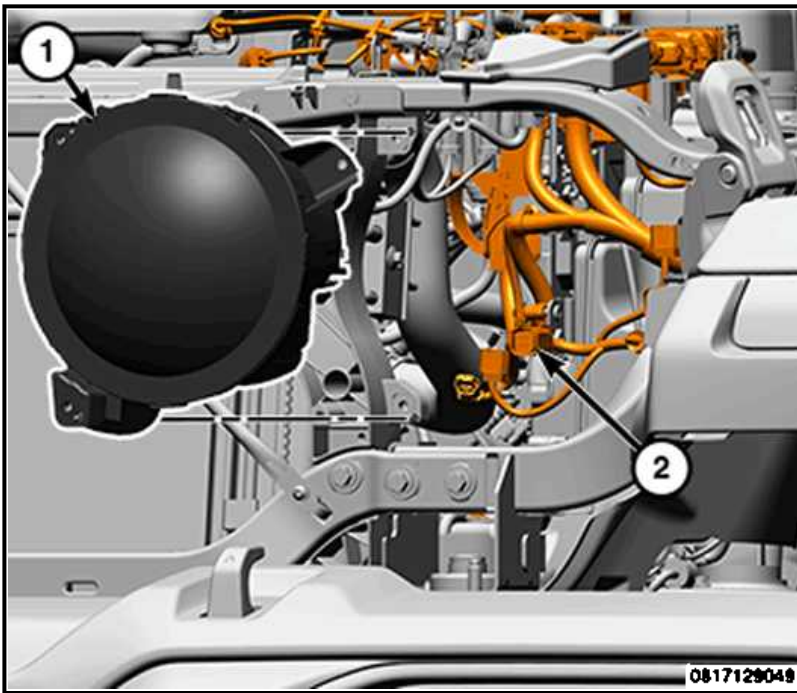
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the grille, Refer to [GRILLE, REMOVAL AND INSTALLATION](#) .



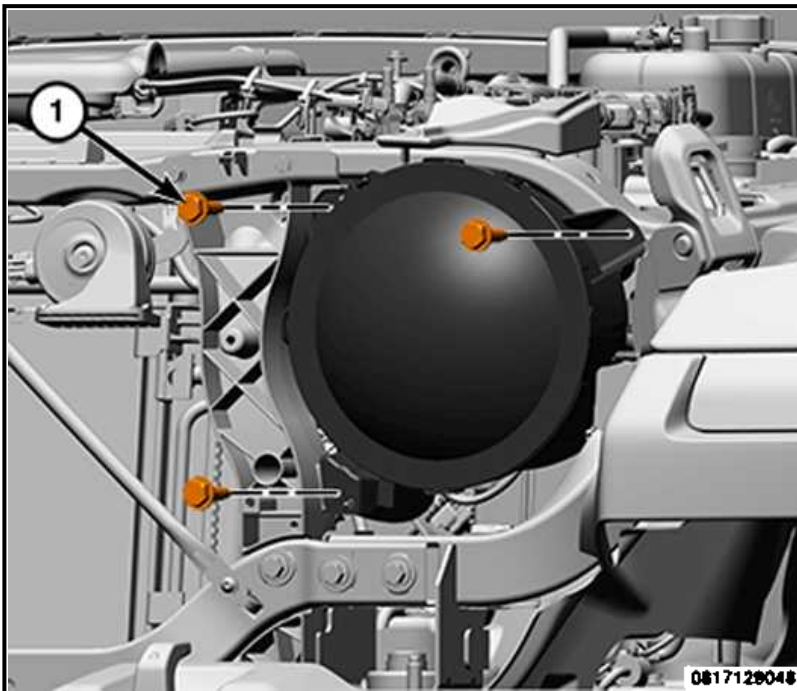
3. Remove the screws (1).



4. Remove the headlamp unit (1) and disconnect the wire harness connectors (2).

INSTALLATION

1. Connect the wire harness connectors (2) and install the headlamp unit (1).



2. Install the screws (1).
3. Install the grille, Refer to [GRILLE, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

HEADLAMP BULBS

REMOVAL AND INSTALLATION

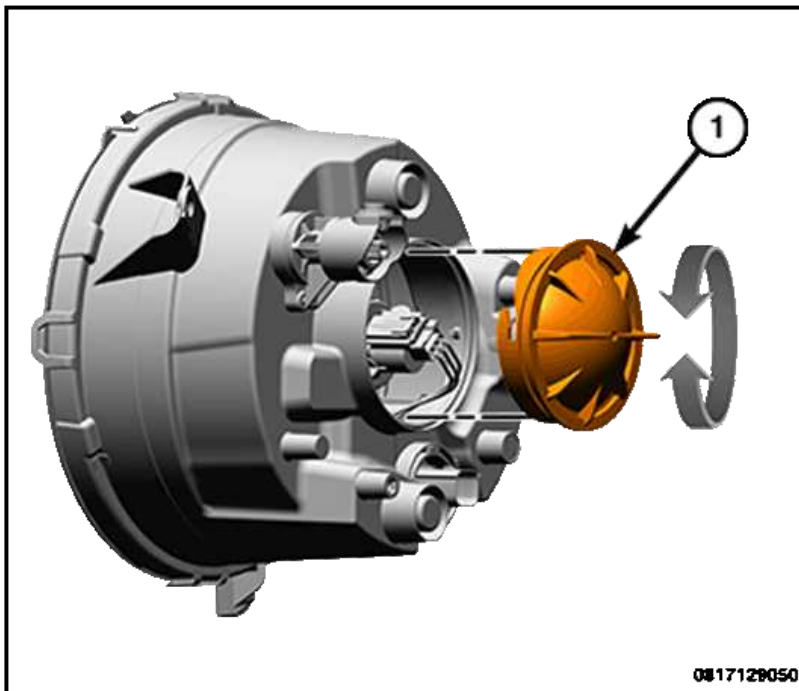
CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

NOTE:

For vehicles equipped with LED headlamp units, the LED is not serviceable separately. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).

REMOVAL

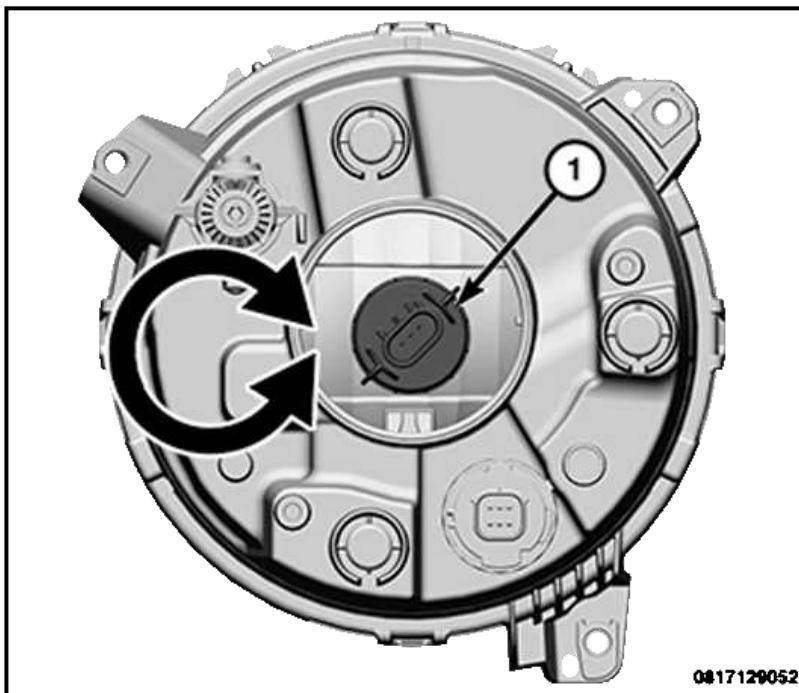
1. Remove the front lamp unit. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).



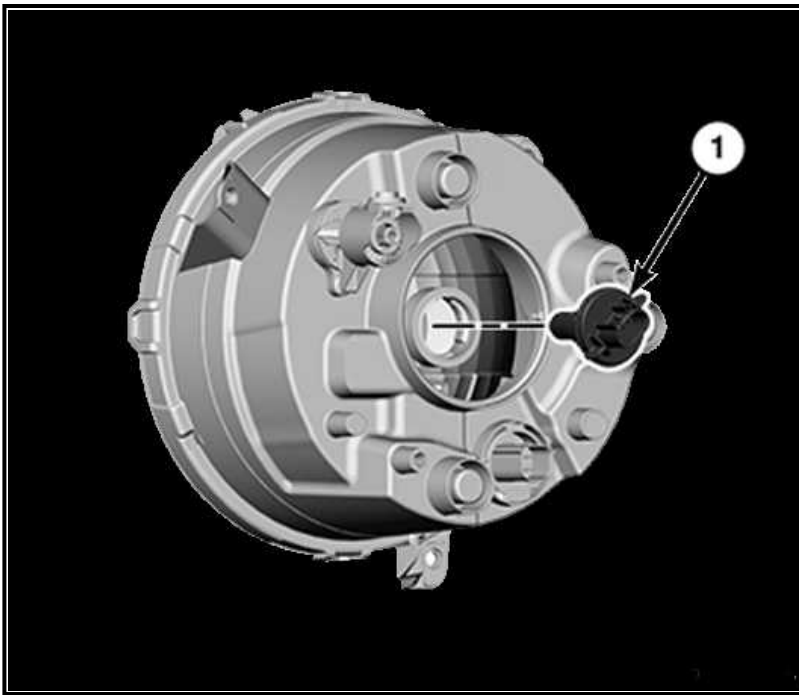
2. Twist the cap (1) counter clockwise and remove.



3. Disconnect the wire harness connector (1).



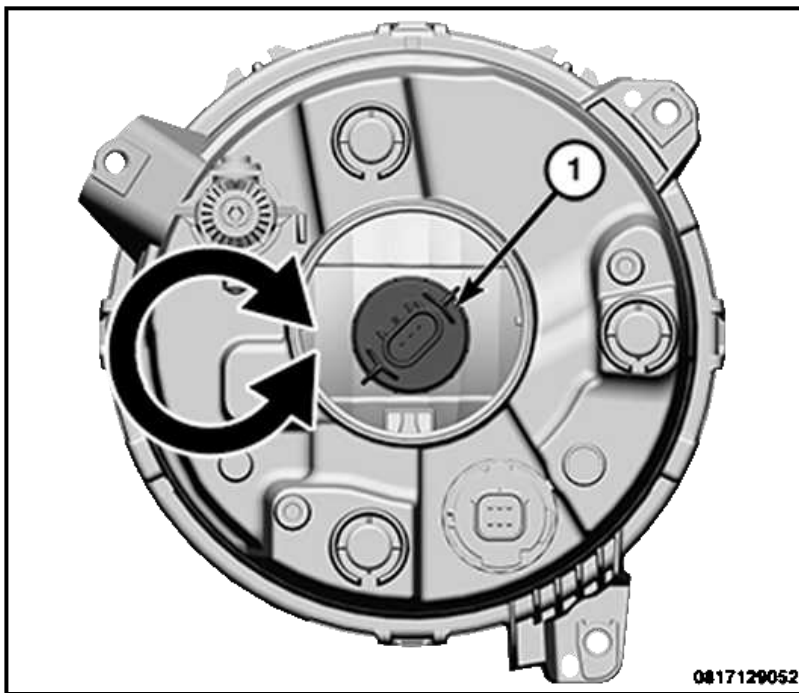
4. Twist the bulb (1) counter clockwise.



5. Remove the bulb (1) from the headlamp unit.

INSTALLATION

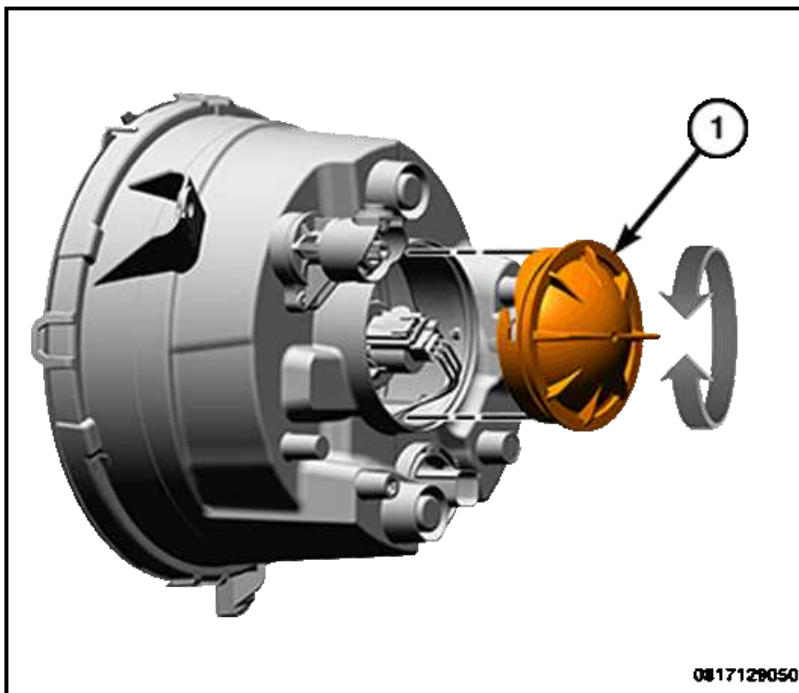
1. Install the bulb (1) into the headlamp unit.



2. Seat the headlamp bulb (1) by rotating the bulb clockwise to secure.



3. Connect the wire harness connector (1).



4. Install, twist the cap (1) clockwise and secure fully.
 5. Install the front lamp unit. Refer to [UNIT, HEADLAMP, REMOVAL AND INSTALLATION](#).
-

2021 ACCESSORIES AND EQUIPMENT

(Left Blind Spot Module Sensor (BSM) (LBSS) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B2199-16	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
B2199-17	BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
B21DD-84	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
B21DD-85	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
B222C-00	VEHICLE CONFIGURATION NOT PROGRAMMED
B223B-00	VEHICLE CONFIGURATION MISMATCH
B22A9-04	ECU INTERNAL PERFORMANCE - SYSTEM INTERNAL FAILURES
B22A9-45	ECU INTERNAL PERFORMANCE-PROGRAM MEMORY FAILURE
B285F-11	BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO GROUND
B285F-15	BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO BATTERY OR OPEN
U0011-00	CAN INTERIOR BUS OFF PERFORMANCE
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0422-00	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
U11FA-00	LOST COMMUNICATION WITH RIGHT BLIND SPOT SENSOR

DIAGNOSIS AND TESTING

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

Continuously runs when the following condition is met:

- Ignition in run.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects that the battery supply voltage is less than 8.0 volts.

Default Action:

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM
FUSED IGNITION OUTPUT CIRCUIT EXCESSIVE RESISTANCE
GROUND CIRCUIT EXCESSIVE RESISTANCE
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE (F923) FUSED IGNITION OUTPUT (RUN) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

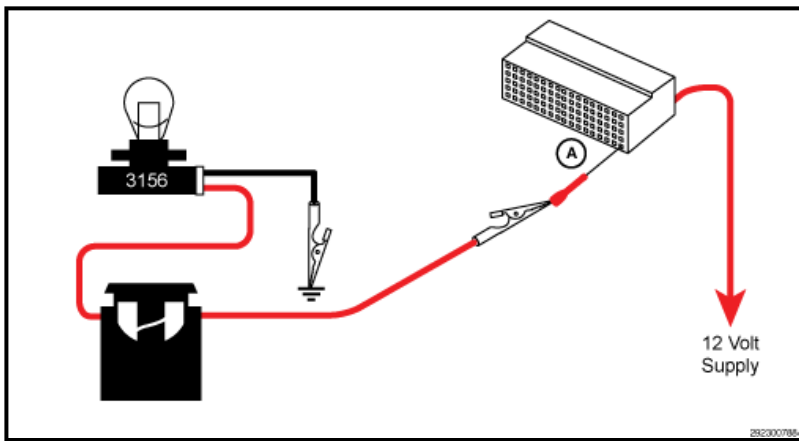
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE (Z925) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

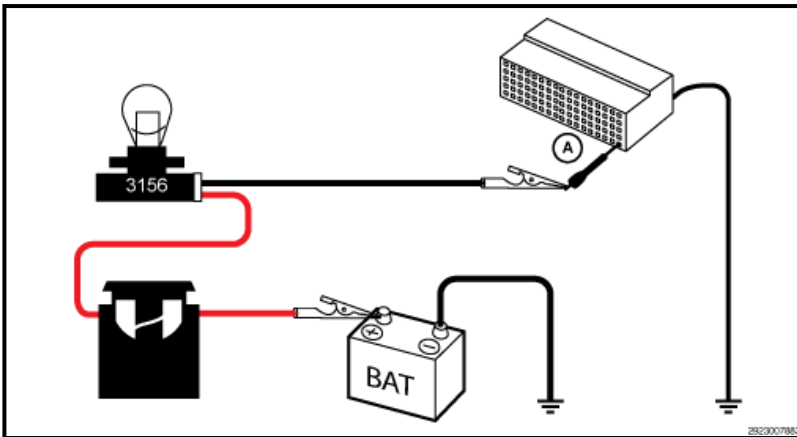
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

**NOTE:**

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all LBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all LBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read LBSS DTCs.

Did the DTC return?

Yes

- Replace the LBSS in accordance with the Service information. Refer to [**SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B2199-17-BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects that the supply voltage is greater than 16.0 volts.

Default Action:

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM LEFT BLIND SPOT SENSOR (LBSS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM RELATED DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Verify the Battery is in good condition. and perform the Battery System diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .
2. With the scan tool in ECU View, select PCM and check for any Charging System related DTCS.

Does the scan tool display any Charging System related DTCS?

Yes

- Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** and perform the appropriate charging system or battery DTC diagnostic procedure.

No

- Replace the LBSS in accordance with the Service information. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on.

SET CONDITION

- When the Body Control Module (BCM) broadcasts a CAN IHS message that the System Voltage that is less than 10.0 volts.

Default Action:

- Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) VOLTAGE RELATED DTCS
VOLTAGE RELATED DTCS SET IN OTHER MODULES
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BCM CHARGING SYSTEM CODES

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system BCM DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go to [3](#)

3. CHECK FOR VOLTAGE RELATED DTCS IN ALL MODULES

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. Check for DTC's in all modules.

Are there any voltage related DTCs set in other modules?

Yes

- Perform the appropriate diagnostic procedure.

No

- Replace LBSS in accordance with the Service information. Refer to [MODULE, BLIND SPOT \(BSM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send

a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is in on.

SET CONDITION

- The Body Control Module (BCM) broadcasts a CAN IHS message that the System Voltage that is greater than 16 volts.

Default Action:

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) VOLTAGE RELATED DTC'S VOLTAGE RELATED DTCS SET IN OTHER MODULES LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **[TESTING FOR AN INTERMITTENT CONDITION](#)** .

2. CHECK FOR BCM CHARGING SYSTEM CODES

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system BCM DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Go to [3](#)

3. CHECK FOR VOLTAGE RELATED DTCS IN ALL MODULES

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. Check for DTC's in all modules.

Are there any voltage related DTCs set in other modules?

Yes

- Perform the appropriate diagnostic procedure.

No

- Replace LBSS in accordance with the Service information.

Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) receives a CAN-IHS bus vehicle configuration message from the BCM.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
VEHICLE CONFIGURATION IN THE LEFT BLIND SPOT SENSOR (LBSS)
VEHICLE CONFIGURATION IN THE BODY CONTROL MODULE (BCM)
INCORRECT BCM HARDWARE OR SOFTWARE PART NUMBER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CONFIGURE THE BCM

1. With the scan tool, perform the Vehicle Configuration routine.
2. With the scan tool, erase DTCs.
3. Cycle the ignition switch from off to on at least five times.
4. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE BCM HARDWARE AND SOFTWARE PART NUMBERS

1. With the scan tool, look at the BCM hardware and software part numbers and record on the repair order.

Are the BCM hardware and software part numbers correct for the vehicle?

Yes

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the BCM in accordance with the service information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B223B-00-VEHICLE CONFIGURATION MISMATCH

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects an incorrect vehicle configuration.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
THE LEFT BLIND SPOT SENSOR (LBSS) RECEIVED THE WRONG VEHICLE CONFIGURATION INFORMATION
BODY CONTROL MODULE (BCM) NOT PROGRAMMED FOR THIS VEHICLE
INCORRECT (BCM) HARDWARE OR SOFTWARE PART NUMBER
INCORRECT LEFT BLIND SPOT SENSOR (LBSS) PART NUMBER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK BCM VEHICLE CONFIGURATION

1. With the scan tool, confirm vehicle Model line is JT.
2. With the scan tool, confirm, Country Code not SNA.
3. With the scan tool, confirm vehicle Model in range of 2018 to 2063.

Are any configurations incorrect?

Yes

- Go To [5](#)

No

- Go To [3](#)

3. CHECK FOR BCM CORRECT HARDWARE

1. Access BCM. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
2. Confirm correct part number.

Is it the correct part number?

Yes

- Go To [4](#)

No

- Replace BCM in accordance with the Service information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK FOR CORRECT LBSS

1. Access LBSS. Refer to [MODULE, BLIND SPOT \(BSM\), REMOVAL AND INSTALLATION](#) .

NOTE:

Do Not Change if the part is not the latest part level, just confirm that it is a Wrangler part.

2. Confirm correct part number.

Is it the correct part number?

Yes

- Go To [5](#)

No

- Replace LBSS in accordance with the Service information. Refer to [MODULE, BLIND SPOT \(BSM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. RESET BCM VEHICLE CONFIGURATION

1. With the scan tool, restore BCM vehicle configuration.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.

B22A9-04-ECU INTERNAL PERFORMANCE - SYSTEM INTERNAL FAILURES

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects an internal hardware failure.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the LBSS in accordance with the Service Information. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

B22A9-45-ECU INTERNAL PERFORMANCE-PROGRAM MEMORY FAILURE

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects an internal software failure.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the LBSS in accordance with the Service Information. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B285F-11-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO GROUND

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- Ignition on in the run position.

- The Blind Spot Indicator is turned on.

NOTE: The Blind Spot Indicator is turned on continuously for a minimum of 2 seconds while the vehicle is driven above 6 mph during an active Blind Spot Alert.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects the Blind Spot Indicator circuit is shorted to ground.

DEFAULT ACTION

- Display Blind Spot System Temporarily Unavailable.

POSSIBLE CAUSES

Possible Causes
LEFT BLIND SPOT INDICATOR DRIVER CIRCUIT SHORT TO GROUND
LEFT BLIND SPOT INDICATOR DRIVER CIRCUIT SHORT TO ANOTHER CIRCUIT
LEFT BLIND SPOT INDICATOR
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR MODULE SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: In order for this DTC test to be completed, the LED in the Driver Door Mirror must be on for a minimum of 2 seconds. There is an RBSS IO control routine to that allows a test tool to turn on and off the LED. An alternate method is to drive the vehicle with an active blind spot alert on the passenger side of the vehicle for longer than 2 seconds.

1.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. ISOLATE AND CHECK THE (P711) LEFT BLIND SPOT SENSOR INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P711) LBSS INDICATOR DRIVER CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE LBSS HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. DISCONNECT THE MIRROR HARNESS CONNECTOR AND VERIFY THE ABILITY OF THE LBSS TO READ THE CONTROL CIRCUIT OPEN OR SHORT TO BATTERY DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. With the ignition in the off position, disconnect the component harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display the B285F-15-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO BATTERY OR OPEN DTC with the connector disconnected?

Yes

- Replace the Right Blind Spot Indicator in accordance with the Service Information. Refer to [**MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION**](#) , or [**MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK RELATED LBSS AND COMPONENT CONNECTIONS

1. Disconnect all LBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all LBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read LBSS DTCs.

Did the DTC return?

Yes

- Replace and program the Right Blind Spot Sensor (LBSS) in accordance with the Service Information. Refer to [**SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- The wiring or poor connection has been repaired
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B285F-15-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO BATTERY OR OPEN

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- Ignition on in run position.
- The Blind Spot Indicator is turned off.

NOTE: **The maturation of this DTC is 10 seconds due to a possible false setting of the DTC if the Doors are removed.**

SET CONDITION

- The Left Blind Spot Sensor (LBSS) detects the Blind Spot Indicator circuit is shorted to voltage or open.

DEFAULT ACTION

- Display Blind Spot System Temporarily Unavailable.

POSSIBLE CAUSES

Possible Causes
LEFT MIRROR DISCONNECTED
LEFT BLIND SPOT INDICATOR DRIVER CIRCUIT SHORTED TO VOLTAGE
LEFT BLIND SPOT INDICATOR DRIVER CIRCUIT OPEN OR HIGH RESISTANCE
LEFT BLIND SPOT INDICATOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
LEFT BLIND SPOT INDICATOR
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR MODULE SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

NOTE: **The maturation of this DTC is 10 seconds due to possible false setting of the DTC if the Doors are removed.**

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. CHECK THE LEFT REAR BLIND SPOT SENSOR AND PASSENGER MIRROR HARNESS CONNECTORS AND TERMINALS

1. Turn the ignition off.
2. Check the Left Rear Blind Spot Sensor harness connector for proper connection at the Left Rear Blind Spot Sensor.
3. Check the Passenger Mirror harness connector for proper connection at the Passenger Mirror.
4. Verify that the connectors are completely plugged in and locked prior to disconnecting.
5. Disconnect the Left Rear Blind Spot Sensor harness connector and check for pushed out or spread terminals, brinelling on terminals, discoloration from excessive heat, or corrosion and water intrusion.
6. Disconnect the Passenger Mirror harness connector and check for pushed out or spread terminals, brinelling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **4**

4. ISOLATE AND CHECK THE (P711) LBSS INDICATOR DRIVER CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE LBSS HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **5**

5. ISOLATE AND CHECK THE (P711) LEFT BLIND SPOT SENSOR INDICATOR DRIVER CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the

circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK THE BLIND SPOT INDICATOR (Z912) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

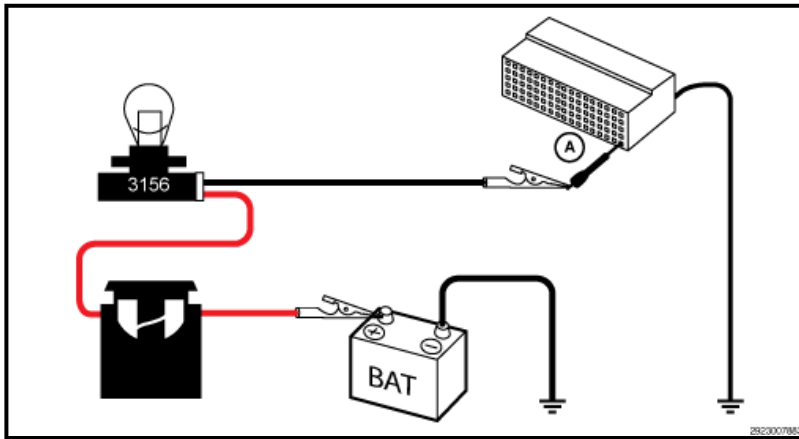
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.

3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [7](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

7. CONNECT A FUSED JUMPER BETWEEN THE (P711) LBSS SIGNAL CIRCUIT AND THE (Z912) SENSOR GROUND CIRCUIT AT THE MIRROR HARNESS CONNECTOR - VERIFY ABILITY OF THE LBSS TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.

NOTE: The maturation of this DTC is 10 seconds due to possible false setting of the DTC if the Doors are removed.

5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Does the scan tool display the B285F-11-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO GROUND DTC with the jumper in place?

Yes

- Replace the Left Blind Spot Indicator in accordance with the Service Information. Refer to [MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION](#) [MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK RELATED LBSS AND COMPONENT CONNECTIONS

1. Disconnect all LBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all LBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read LBSS DTCs.

Did the DTC return?

Yes

- Replace and program the Left Blind Spot Sensor (LBSS) in accordance with the Service Information. Refer to [SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- The wiring or poor connection has been repaired
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U11FA-00-LOST COMMUNICATION WITH RIGHT BLIND SPOT SENSOR

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Left Blind Spot Sensor (LBSS) does not receive messages from the Right Blind Spot Sensor (RBSS).

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION OUTPUT (RUN) CIRCUIT OPEN OR SHORTED TO GROUND
GROUND CIRCUIT(S) OPEN
CAN IHS BUS CIRCUIT(S) OPEN
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read LBSS DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE RBSS (F923) FUSED IGNITION OUTPUT (RUN) CIRCUIT FOR AN OPEN

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (Z926) RBSS GROUND CIRCUIT FOR AN OPEN

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the

circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. ISOLATE AND CHECK THE (D217) AND (D218) CAN IHS BUS CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all LBSS and RBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all LBSS and RBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read LBSS DTCs.

Did the DTC return?

Yes

- Replace the RBSS in accordance with the Service Information. Refer to [**SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
 - Test complete.
-

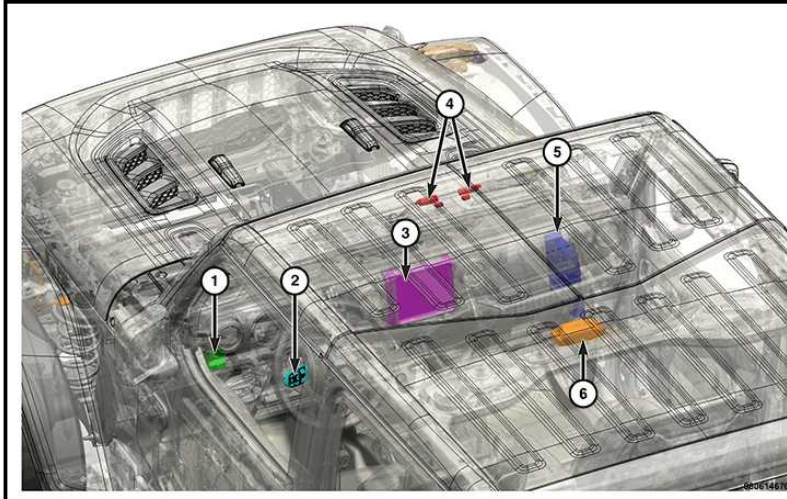
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Navigation/Telecommunication (Service Information) - Gladiator

DESCRIPTION AND OPERATION

HANDS FREE PHONE

DESCRIPTION



The Hands Free Phone system includes the following major components that are used with a BluetoothB® compatible phone:

COMPONENT INDEX

1.	Refer to <u>LONG TERM EVOLUTION 2 (LTE2) ANTENNA.</u>
2.	Refer to <u>ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH POD.</u>
3.	Refer to <u>RADIO</u> with built in BluetoothB® antenna.
4.	Refer to <u>MICROPHONES.</u>
5.	Refer to <u>BODY CONTROL MODULE (BCM).</u>
6.	Refer to <u>LONG TERM EVOLUTION 1 (LTE1) ANTENNA.</u>

A UconnectB® Hands Free Phone system is factory-installed optional equipment. This system allows connection of compatible mobile phones for hands free use in sending and receiving phone calls and text messages as well as for streaming audio from those devices through the audio system in the vehicle.

The radio also contains a microcontroller and programming that allows it to communicate with other electronic modules in the vehicle over the Controller Area Network - Interior High Speed (CAN-IHS) data bus. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#) .

The UconnectB® Hands Free Phone system components cannot be adjusted or repaired. If any Hands Free Phone system component is damaged or ineffective, that component must be replaced. The Hands Free Phone system software is flash programmable through the Universal Serial Bus (USB) port.

OPERATION

The UconnectB® Hands Free Phone system relies upon BluetoothB® technology to enable wireless connectivity between BluetoothB® compatible, paired and turned ON mobile devices and the on-board entertainment system components. This system also relies upon Advanced Speech Recognition (ASR) software to enable verbal commands to control the mobile device as well as the components and features of some other on-board systems.

The system will recognize up to 10 BluetoothB® compatible devices, each of which is identified within the system by the name acquired from the device during the pairing process. The Hands Free Phone system will communicate with a paired device that is anywhere within the vehicle. However, covering the paired device with a metal object may block the signal.

The Hands Free Phone system is operated in one of two ways: actively or passively. Active operation begins with the vehicle operator pressing a push button on the left steering wheel switch pod on the left side of the Driver AirBag (DAB) trim cover in the center of the steering wheel. The UconnectB® Voice Recognition (**VR**) button is pressed for hands free voice activated access to available features other than the phone, or the UconnectB® Phone (**Phone** identified by a phone handset icon) button is pressed for hands free phone access.

The **VR** or **Phone** button press provides a resistor multiplexed input to the BCM. The BCM is a gateway to the CAN-IHS data bus and sends an electronic **switch press** message over the CAN-IHS data bus to the radio.

When the radio receives the electronic **switch press** message, the radio suppresses any current audio output and issues an audible **beep** to indicate that the VR hardware is prepared to receive a verbal command. Part of the UconnectB® Hands Free Phone system hardware includes the VR stereo microphones in the upper windshield header trim just above the rearview mirror centered between the sun visors on the windshield. The microphones provide a hardwired input of verbal commands to the VR engine within the radio, and the ASR software converts that input into an electronic instruction message broadcast over the CAN-IHS data bus to invoke the appropriate system response. If no appropriate verbal command is received within a few seconds following the audible **beep**, the system will provide an audible verbal output listing a menu of the available voice activation options.

Passive operation begins when an incoming cellular call is received. If the BluetoothB® phone is Short Message Service (SMS) text message capable and compatible with the UconnectB® system (see the UconnectB® web site), passive operation will also begin when an SMS text message is received. The call or SMS text message is relayed to the BluetoothB® transceiver embedded within the radio. The BluetoothB® transceiver then instructs the radio to announce the incoming call or message. The vehicle operator presses the UconnectB® **Phone** button in the steering wheel switch pod or the soft button that will appear in the radio display to accept the call or to accept the message.

The BluetoothB® transceiver connects the voices of the two phone parties using outputs through the audio system speakers and inputs through the UconnectB® hands free microphone. In the case of a text message, the BluetoothB® transceiver sends the message to the VR hardware and the ASR software converts the message from text to voice and plays it through the audio system speakers. The text message can then be replied to by pressing the UconnectB® **VR** button and giving an **SMS** verbal command to select from several predetermined short text phrase responses.

The Hands Free Phone system operates on battery current received through a fused B(+) circuit, but also monitors the ignition switch status through electronic messages received over the CAN-IHS data bus. If a call is in progress when the status of the ignition switch transitions to OFF, the system will continue to operate until the call has been completed.

The radio receives electronic message inputs over the CAN-IHS data bus related to the Hands Free Phone system. The radio is also connected to the CAN - Chassis (CAN-C) data bus; however, the radio is not a CAN gateway. All electronic message outputs of the radio are carried over the CAN-IHS data bus. When the radio monitors a problem in any of the audio system circuits and components, or in any of the BluetoothB® transceiver circuits, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit.

BLUETOOTHB® PHONE

A compatible, customer-supplied and paired BluetoothB® phone is a required component of the hands free phone system. A list of suggested phones and providers is available at: <https://www.driveuconnect.com>

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to **COMPONENT INDEX**.

Outputs

- Average calculated vehicle speed
- Average vehicle speed fault status

ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH POD

ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH POD

Refer to [COMPONENT INDEX](#).

The three lower switches in the EVIC switch pod are normally open, resistor multiplexed momentary switches that are hardwired to the BCM through the steering wheel wire harness and the clockspring on the steering column. The BCM reads the remote radio switch inputs then sends the appropriate electronic messages to the radio over the CAN-IHS data bus to invoke the requested command.

The hardwired circuits between the remote radio switches and the BCM may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the UconnectB® switches or the electronic communication between modules that provide the features of the remote radio switches. The most reliable, efficient and accurate means to diagnose the remote radio switches or the electronic communication related to remote radio switch operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

LONG TERM EVOLUTION 1 (LTE1) ANTENNA

LONG TERM EVOLUTION 1 (LTE1) ANTENNA

Refer to [COMPONENT INDEX](#).

The vehicle is equipped with two cellular phone antennas. The LTE1 antenna is used for sending and receiving cellular telephone signals and data. The signals and data are supplied to the radio.

The LTE1 antenna is mounted in the center of the middle sports bar, to the left of the Global Positioning System (GPS) and Satellite Digital Audio Radio Service (SDARS) antenna (if equipped). The use of two LTE antennas is for the purpose of increasing data upload and download speeds.

LONG TERM EVOLUTION 2 (LTE2) ANTENNA

LONG TERM EVOLUTION 2 (LTE2) ANTENNA

Refer to [COMPONENT INDEX](#).

The vehicle is equipped with two cellular phone antennas. The LTE2 antenna is used for sending and receiving cellular telephone signals and data. The signals and data are supplied to the radio and telematics modules.

The LTE2 antenna is mounted in the instrument panel, behind the headlamp switch. The use of two LTE antennas is for the purpose of increasing data upload and download speeds.

The LTE2 antenna has an internal 10 kilohm resistor to set a Diagnostic Trouble Code (DTC) in the module to which it is connected if the antenna cable or LTE2 antenna is disconnected from that module.

MICROPHONES

MICROPHONES

Refer to [COMPONENT INDEX](#).

When the hands free VR control circuitry integral and internal to the radio detects the appropriate inputs or requests, it energizes the circuitry of the stereo microphones in the upper windshield header trim just above the rearview mirror centered between the sun visors. The microphones remain active until they are deactivated by the hands free VR control circuitry, or until the status of the ignition transitions to OFF, whichever occurs first.

The inputs from the microphones are processed, filtered and redirected by the VR control circuitry and logic as appropriate. Those inputs can be redirected to the ASR engine or to the audio send circuitry of the BluetoothB® transceiver. Each of these electronic modules is also integral and internal to the radio.

When the vehicle is equipped with an Emergency Assistance Module (EAM) in markets that require it, the left microphone is connected directly to and use by the EAM, which then also acts as a pass-through so that the left microphone signals can be used by the UconnectB® hands free system.

In markets where the EAM is optional equipment, both microphones are connected directly to the radio.

The status of the UconnectB® + SiriusXMB® Guardian **Assist** and **SOS** push buttons is relayed by hardwired from the Passenger Airbag Indicator to the EAM. In vehicles without EAM, the BCM, which is also a CAN data bus gateway, relays the push button status information to the radio over the CAN-IHS data bus.

RADIO

RADIO

Refer to **COMPONENT INDEX**.

The radio becomes operational when it receives a wake up signal over the CAN-C data bus indicating the status of the ignition switch is ON or Accessory. For additional information on the operation of the radio or media system in the vehicle, see the heading for the appropriate audio system option in the User Guide or the service information. See the UconnectB® web site (<https://www.driveuconnect.com/>) for more information, or refer to the **For Owners** link on the vehicle brand web site for copies of those publications.

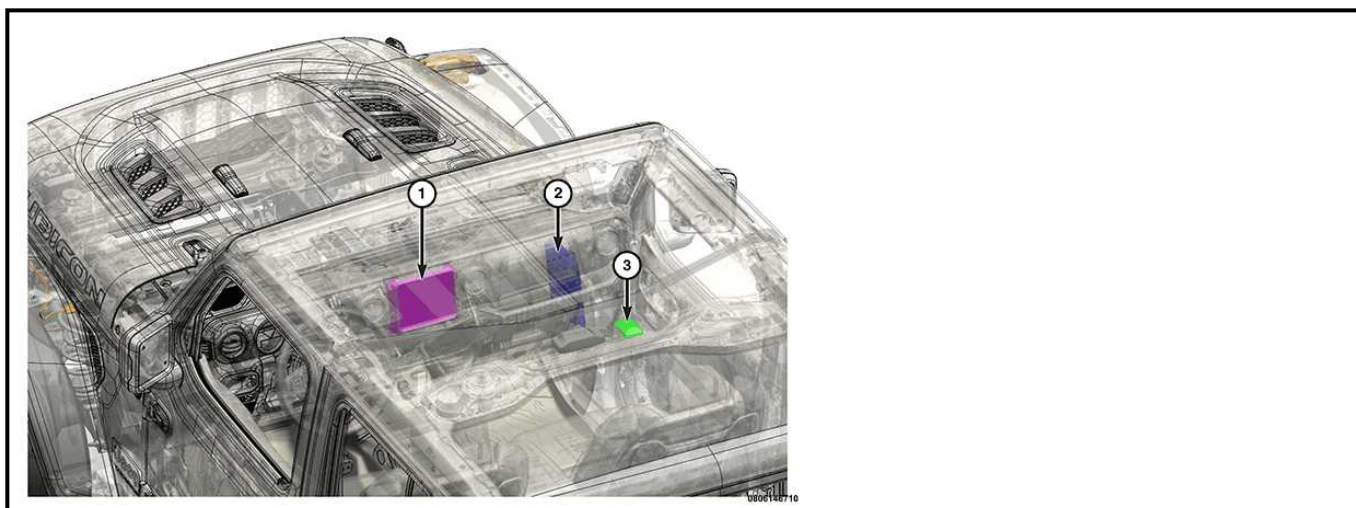
The radio uses a mast antenna mounted on the right fender for AM/FM signal reception and, depending upon vehicle optional equipment, a windshield mounted Digital Audio Broadcast antenna for reception of digital audio broadcast radio signals in markets that use the digital audio broadcast format, a roof mounted GPS/SDARS antenna for reception of GPS and SDARS signals, and two LTE antennas for reception and transmission of cellular telephone signals and data.

Depending upon the audio system options, the radio can play audio from many different media sources. The media can be played by connecting the source to the audio system via a 3.5 millimeter auxiliary (AUX) port, a USB port or through wireless BluetoothB® audio streaming. Refer to the UconnectB® web site (<https://www.driveuconnect.com/>) for compatibility information.

NOTE: USB devices (for example, camera memory USB adaptors, USB drives and others, excluding Apple products) must comply with the Mass Storage Device (MSD) standard. This remote USB port can provide power to the inserted device.

NAVIGATION

DESCRIPTION



The navigation system includes the following major components:

COMPONENT INDEX

1.	Refer to <u>RADIO</u> .
2.	Refer to <u>BODY CONTROL MODULE (BCM)</u> .
3.	Refer to <u>GLOBAL POSITION SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA</u> .

The radio is located within the instrument panel and is the primary component of the hands free phone system in this vehicle. Depending upon selected vehicle optional equipment the radio may include a microcontroller, a BluetoothB® transceiver, a navigation module, flash memory and sophisticated Advanced Speech Recognition (ASR) input capability through Voice Recognition (VR) software. The ASR software includes many different available languages. Each vehicle is equipped with a list of available languages, which are made available from the factory based upon languages most commonly used for the market destination. Refer to **DESCRIPTION AND OPERATION** .

A factory-installed satellite navigation system based upon the GPS is an available option on this vehicle. A color touchscreen electronic display in the radio provides a graphical interface for programming, searching for and selecting destinations. In vehicles also equipped with a UconnectB® Hands Free telecommunication option, the available navigation systems are also equipped with ASR input capability allowing hands free operation.

This navigation system provides visual guidance through dynamic maps, while voice prompts through the audio system of the vehicle provide the vehicle operator with audible alerts and directions coordinated with the visual displays. The system also displays and logs valuable trip information such as speed, posted speed limit, distance and Estimated Time of Arrival (ETA).

The radio also contains a microcontroller and programming that allows it to communicate with other electronic modules in the vehicle using the Controller Area Network - Interior High Speed (CAN-IHS) data bus. Refer to **COMMUNICATION, DESCRIPTION AND OPERATION** .

OPERATION

The optional navigation system is active whenever the radio electronic display is powered ON. If a navigation system menu or map is not being actively displayed, the system is still operating in the background. The menu, map or route that was active when the radio was powered OFF along with all other user-relevant information is saved in nonvolatile memory by the navigation module for display again the next time the radio is powered ON and the navigation system is selected.

Once a destination is selected, the navigation system uses information from stored map data to quickly calculate a route. As the vehicle is driven along that route, the vehicle operator is guided with visual displays and voice prompts. Any variances from that route will cause the navigation system to automatically recalculate and deliver a revised route to the chosen destination.

All vehicles have their original map and Points-Of-Interest (POI) data stored in nonvolatile flash memory integral to the navigation module integral and internal to the radio. Updated map and POI data as well as updated navigation software for these vehicles can be uploaded to the system using Universal Serial Bus (USB) media. The originally installed data is based upon the market for which the vehicle was manufactured. Navigation software updates are also uploaded to the system using USB media.

The GPS receiver of the navigation module is capable of acquiring and tracking GPS signal inputs through the roof-mounted GPS/SDARS antenna from numerous satellites simultaneously to calculate and display the position and direction of the vehicle. However, when access to satellite signals is blocked by bridges, tunnels or other obstacles, the navigation module relies upon Dead Reckoning (DR) to aid in calculating vehicle position and direction. The navigation module uses pulse signals from the wheel speed sensors, a Reverse gear indicator input and an internal electronic gyroscope sensor to provide DR vehicle position and direction calculations to supplement GPS satellite signals.

User input mechanisms for the navigation system include the radio touchscreen and the UconnectB® Hands Free VR verbal commands. The VR function uses ASR software. Master control of the VR function is handled by the VR engine internal and integral to the radio. The VR recognizes and responds to certain global commands, while other commands are specific to the radio or the navigation system.

For safety reasons some input, editing and setting features of the navigation system are restricted when the vehicle is in motion or when a hands free phone call is active. This includes many features that require touchscreen inputs. However, many of those same features disabled for touchscreen inputs remain enabled for UconnectB® Hands Free VR inputs.

The navigation module receives electronic message inputs within the radio over the CAN-IHS data bus; however, the radio is not a CAN gateway. All electronic message outputs of the navigation module and the radio are carried over the CAN-IHS data bus. When the radio monitors a problem in any of the audio system circuits and components, or in any of the navigation system antenna circuits, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit. The external combination antenna may be diagnosed separately from the radio.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

Inputs

- Transmission reverse gear status
- Vehicle speed signal
- Vehicle speed fault status
- Wheel speed sensor fault status

Outputs

- Wheel speed sensor fault status
- Vehicle speed signal
- Vehicle speed fault status
- Transmission reverse gear status

GLOBAL POSITION SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA

GLOBAL POSITION SYSTEM (GPS) AND SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) ANTENNA

Refer to [**COMPONENT INDEX**](#).

The GPS/SDARS antenna is used to receive GPS tracking and satellite data.

RADIO

RADIO

Refer to [COMPONENT INDEX](#).

Inputs

- Radio Mode status
- Dead reckoning information
- GPS data
- GPS antenna fail information
- Touchscreen input request
- Outputs from BCM
- Distance unit

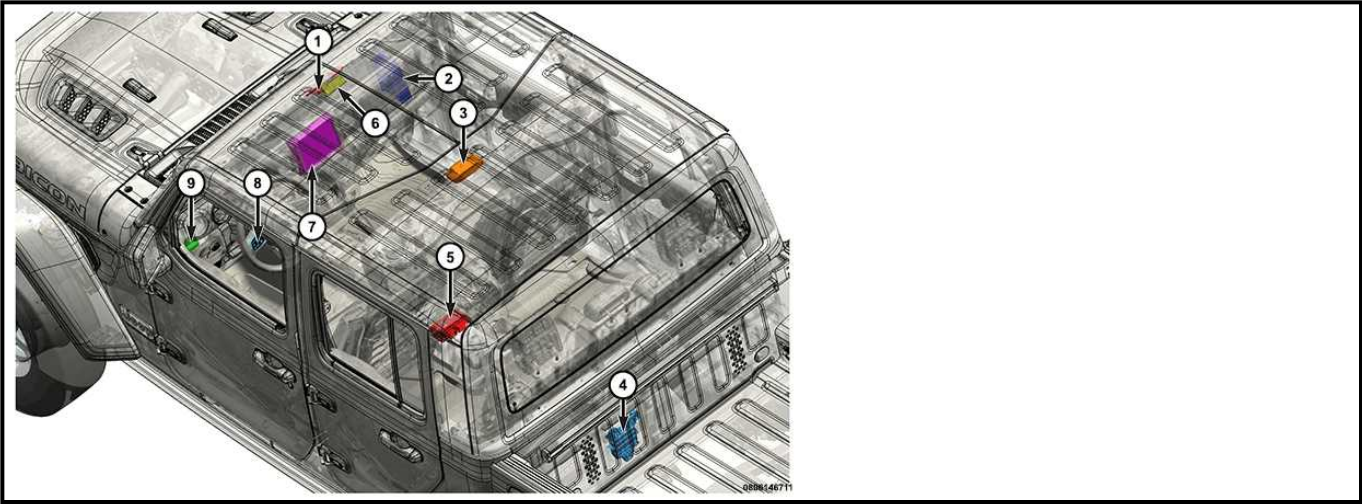
Outputs

- Short distances unit data
- Navigation vocal instructions
- Navigation visual instructions information

The navigation system components cannot be adjusted or repaired. If any of the navigation system components is damaged or ineffective, that component must be replaced. The external combination antenna can be repaired separately from the radio. The navigation system software as well as the map data is flash programmable through the USB port.

UCONNECT + SIRIUSXM GUARDIAN

DESCRIPTION



The UconnectB® + SiriusXMB® Guardian™ system includes the following major components:

COMPONENT INDEX

1.	Refer to MICROPHONES .
2.	Refer to BODY CONTROL MODULE (BCM) .
3.	Refer to LONG TERM EVOLUTION 1 (LTE1) ANTENNA .
4.	Refer to RADIO FREQUENCY HUB (RFH) MODULE .
5.	Refer to OCCUPANT RESTRAINT CONTROLLER (ORC) .
6.	Refer to SOS/ASSIST SWITCHES - part of the Passenger AirBag (PAB) Indicator.
7.	Refer to RADIO .

8.	Refer to <u>ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH POD.</u>
9.	Refer to <u>LONG TERM EVOLUTION 2 (LTE2) ANTENNA.</u>

A customer-supplied and paired Bluetooth® smart phone is a required component of the UconnectB® + SiriusXMB® Guardian™ system to enable remote services.

A UconnectB® feature for the SiriusXMB® Guardian™ system is optional equipment that uses an embedded cellular module within the radio to enable several mobile connectivity features. Vehicles equipped with the UconnectB® + SiriusXMB® Guardian™ system can be readily identified by two switch buttons on the PAB Indicator, located in the windshield header, identified with **ASSIST** and **SOS** labels.

To enable SiriusXMB® Guardian™, a subscription must be completed by the customer. Detailed directions for subscription along with other information relating to UconnectB® + SiriusXMB® Guardian™ can be found within the UconnectB® + SiriusXMB® Guardian™ owner manual supplement for the supported radios.

NOTE: **A free trial period of SiriusXMB® Guardian™ may be offered with the sale of a new vehicle. Registration will be required to activate the trial subscription.**

Subscription to SiriusXMB® Guardian™ provides many features that allow cellular smart phones to be put away in favor of the integrated mobile connectivity features and functionality accessible through the use of the radio, steering wheel and voice controls in the vehicle. All SiriusXMB® Guardian™ features are only available based on subscription. Features are continually being added or changed and offerings at the time this information was last updated included:

- **SOS/Assist** - The following call features are executed through the embedded cellular module of the radio:
 - **SOS** - Pressing the **SOS** button will initiate an emergency call to a SiriusXMB® Guardian™ Customer Care operator. The Global Positioning System (GPS) coordinates of the vehicle are made available to the customer care operator in the event help needs to be sent. In addition it opens a two way voice channel with the customer care operator allowing communication between the vehicle occupant and the operator.
 - **Assist** - Pressing the **ASSIST** button will present the customer with four choices. UconnectB® Care, Vehicle Care, Roadside Assistance or SiriusXMB® Guardian™ Customer Care. These selection options are presented as soft keys in the radio display. Selecting any one of these choices will place a call to the selected group. If there are questions about UconnectB® Services, UconnectB® Care can be contacted; if there are questions related to vehicle functionality, Vehicle Care can be contacted; if Roadside Assistance is needed, a direct call can be made; or, if assistance from a SiriusXMB® Guardian™ Customer Care operator is needed, a call can be placed to connect with a customer care operator.
- **Applications** - Some of the SiriusXMB® Guardian™ applications (apps) presently available include:
 - **Off-Road Pages** - The vehicle may be equipped with Off-Road Pages, which provides the vehicle status while operating on off-road conditions. It supplies information relating to the vehicle ride height, the status of the transfer case, the pitch and roll of the vehicle, if equipped.

To access Off-Road Pages, press the Apps button on the touchscreen, and then select "Off-Road Pages". Refer to the service information for details of Off-Road pages content.

- **Vehicle Health Reports** - The vehicle will send the customer a monthly email report, which summarizes the performance of their vehicle's key systems so they can stay on top of their vehicle's maintenance needs. The customer can get additional information about this feature at the Owner Site website (<https://www.mopar.com/dodge> or <https://www.mopar.com/chrysler>).
- **Vehicle Health Alerts** - The vehicle will send the customer Vehicle Health Alerts when it detects issues with its key systems that need attention. The customer can get additional information about this feature at the Owner Site website (<https://www.mopar.com/dodge> or <https://www.mopar.com/chrysler>).

- **Send & Go** - The Send & Go feature of the SiriusXMB® Guardian™ Mobile App allows the customer to search for a destination on their mobile device and then send the route to the vehicle's navigation system.
- **Points Of Interest Search** - A Points Of Interest (POI) Search app gives the vehicle owner access to local business and destination information previously available on the internet or through a mobile app, adapted for use on the radio in their vehicle. The POI Search app provides searches using predefined search categories, or custom searches using keywords and voice recognition.
- **Notifications** - Customers have the option to sign up for automatic electronic mail (email) or text message (Short Message Service/SMS) notifications when an SiriusXMB® Guardian™ remote services command is processed or if their vehicle theft alarm has been triggered. These notifications are set up through the SiriusXMB® Guardian™ account of the customer (www.siriusxm.com/guardian).
- **Remote Services** - The distance of remote services normally available through the Key Fob can be extended through SiriusXMB® Guardian™. These services may include remote door Lock/Unlock, remote horn and lights (Panic Mode) and remote start. An active SiriusXMB® Guardian™ subscription is required and the customer must install the SiriusXMB® Guardian™ smart phone app on their phone. The app can be obtained by downloading it from the play store for their phone. Once the smart phone app is installed, the remote services can be controlled by the customer online through their SiriusXMB® Guardian™ account.

Remote services can also be controlled through the customer's (<https://www.mopar.com/dodge> or <https://www.mopar.com/chrysler>) site. This site will allow the customer to manage their SiriusXMB® Guardian™ account if desired as well.

NOTE: **Remote services are only available based on factory installed options. Options installed at the dealer are not eligible for these services.**

- **Stolen Vehicle Assistance** - If the vehicle is stolen, stolen vehicle assistance can be used to help the police locate the vehicle. This service is based on the request of the customer to SiriusXMB® Guardian™ and must first be reported to local authorities and a police report reference number obtained. SiriusXMB® Guardian™ will not provide stolen vehicle assistance without a police report reference number.
- **SiriusXMB® Guardian™ Registration And Applications** - SiriusXMB® Guardian™ registration must be completed before individual radio apps or SiriusXMB® Guardian™ subscription packages can be purchased from the SiriusXMB® Guardian™. Many additional SiriusXMB® Guardian™ and UconnectB® apps are under development for later release.

Refer to <https://www.driveuconnect.com> for the latest information and helpful videos describing all of the UconnectB® services and offerings.

The radio contains a microcontroller and programming that allows it to communicate with other electronic modules in the vehicle over the Controller Area Network - Interior High Speed (CAN-IHS) data bus. In vehicles equipped with UconnectB® Access, the radio also uses electronic message communication with other electronic modules in the vehicle over the CAN - Chassis (CAN-C) data bus. Refer to **COMMUNICATION, DESCRIPTION AND OPERATION** .

OPERATION

UconnectB® + SiriusXMB® Guardian™ capability relies on cellular (telematics) technology and subscribed services that are controlled through Digital Rights Management (DRM). The management or DRM along with specific services occur wirelessly through the cloud. Digital rights and a subscription determine the specific services a customer is eligible to receive. Data feeds between FCA US LLC assembly plants and its radio suppliers are provided to the cellular provider to enable initial capability or provisioning. This initial data must exist in the database of the cellular provider or functionality will be unavailable. Base features are supported through software that exists within the applicable radio platform and cellular connectivity is provided through the embedded cellular module.

Signal strength and data capability are shown adjacent to the **Apps** orb soft key found at the lower right corner of the radio touchscreen. Depending on location and coverage, data capability can change. Signal strength is a major factor for any wireless connectivity. Fourth Generation (4G) LTE data is the highest connectivity available at this time. Remote Service features (Start, Lock, Unlock, and others) rely on data capability. If the vehicle is located in an area of no or low coverage, the Remote Services features may not function. Signal strength and data capability can suffer from the same situations any cellular device might experience. Parking structures, blocks, drops and dead zones can affect performance at any time.

The two switch buttons on the rearview mirror, identified with **ASSIST** and **SOS** provide a hardwired input to the Local Interface Network (LIN) slave node integral to the rearview mirror. The LIN slave node sends an electronic **switch press** message to the LIN master node integral to the BCM. The BCM relays the message over the CAN-IHS data bus, where it is retrieved by the radio.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX.**](#)

The BCM is the configuration master node for the vehicle.

ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH POD

ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) SWITCH POD

Refer to [**COMPONENT INDEX.**](#)

The EVIC switch pod is located in the left horizontal spoke of the steering wheel. In addition to the EVIC switch buttons the lower portion of this switch pod contains the Voice Recognition (VR) switch button and the Phone switch button of the hands free phone system. For additional information on the EVIC switch. Refer to [**DESCRIPTION AND OPERATION .**](#)

LONG TERM EVOLUTION 1 (LTE1) ANTENNA

LONG TERM EVOLUTION 1 (LTE1) ANTENNA

Refer to [**COMPONENT INDEX.**](#)

The vehicle is equipped with two cellular phone antennas. The LTE1 antenna is used for sending and receiving cellular telephone signals and data. The signals and data are supplied to the radio.

The LTE1 antenna is mounted in the center of the middle sports bar, to the left of the GPS and Satellite Digital Audio Radio Service (SDARS) antenna (if equipped). The use of two LTE antennas is for the purpose of increasing data upload and download speeds.

LONG TERM EVOLUTION 2 (LTE2) ANTENNA

LONG TERM EVOLUTION 2 (LTE2) ANTENNA

Refer to [**COMPONENT INDEX.**](#)

The vehicle is equipped with two cellular phone antennas. The LTE2 antenna is used for sending and receiving cellular telephone signals and telematics data. The signals and data are supplied to the radio and telematics modules.

The LTE2 antenna is mounted in the instrument panel, behind the headlamp switch. The use of two LTE antennas is for the purpose of increasing data upload and download speeds.

The LTE2 antenna has an internal 10 kilohm resistor to set a Diagnostic Trouble Code (DTC) in the module to which it is connected if the antenna cable or LTE2 antenna is disconnected from that module.

MICROPHONES

MICROPHONES

Refer to [**COMPONENT INDEX**](#).

Two stereo microphones are in the upper windshield header trim just above the rearview mirror centered between the sun visors in vehicles equipped with the UconnectB® Hands Free Phone system.

When the vehicle is equipped with an Emergency Assistance Module (EAM) in markets that require it, the left microphone is connected directly to and use by the EAM, which then also acts as a pass-through so that the left microphone signals can be used by the UconnectB® hands free system.

In markets where the EAM is optional equipment, both microphones are connected directly to the radio.

OCCUPANT RESTRAINT CONTROLLER (ORC)

OCCUPANT RESTRAINT CONTROLLER (ORC)

Refer to [**COMPONENT INDEX**](#).

The ORC module has a dedicated hardwired circuit that provides an input to the radio whenever a Supplemental Restraint System (SRS) deployment occurs in the vehicle.

RADIO FREQUENCY HUB (RFH) MODULE

RADIO FREQUENCY HUB (RFH) MODULE

Refer to [**COMPONENT INDEX**](#).

The RFH module is a key component of the UconnectB® + SiriusXMB® Guardian™ remote vehicle services feature. The RFH module is located behind the left rear retractor trim panel.

RADIO

RADIO

Refer to [**COMPONENT INDEX**](#).

The radio is located near the top of the instrument panel center stack area and is the primary component of the UconnectB® + SiriusXMB® Guardian™ system in this vehicle. The radio includes a microcontroller, a BluetoothB® transceiver, a navigation module, flash memory and sophisticated Advanced Speech Recognition (ASR) input capability through VR software. The ASR software includes many different available languages. Each vehicle is equipped with a list of available languages, which are made available from the factory based upon languages most commonly used for the market destination.

BluetoothB® antennas are also internal and integral to the radio.

SOS/ASSIST SWITCHES

SOS/ASSIST SWITCHES

Refer to [**COMPONENT INDEX**](#).

In vehicles equipped with UconnectB® + SiriusXMB® Guardian™, the PAB Indicator contains two integral push button switches with a Light Emitting Diode (LED) indicator on each push button switch to indicate activation of the **ASSIST** and **SOS** features.

The UconnectB® + SiriusXMB® Guardian™ system components cannot be adjusted or repaired. If any UconnectB® + SiriusXMB® Guardian™ system component is damaged or ineffective, that component must be replaced. The external combination antenna can be repaired separately from the radio. The UconnectB® + SiriusXMB® Guardian™ system software is flash programmable through the USB port. If the **ASSIST** or **SOS** buttons are damaged or ineffective, the PAB Indicator must be replaced.

DIAGNOSIS AND TESTING

HANDS FREE PHONE

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The hardwired circuits between components related to the radio and the UconnectB® Hands Free Phone system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, wire harness routing and retention, connector pin-out information, and location views for the various wire harness connectors, splices, and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in diagnosing the radio or the electronic controls and communication between modules and other devices that provide some features of the UconnectB® Hands Free Phone system. The most reliable, efficient, and accurate means to diagnose the radio or the electronic controls and communication related to UconnectB® Hands Free Phone system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

NOTE:

Validation and diagnosis of many of the conditions listed below will require access to both the paired BluetoothB® device and the Personal Identification Number (PIN) needed for that device.

HANDS FREE PHONE DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
PHONE NOT AVAILABLE	1. BluetoothB® phone not paired to the radio. 2. BluetoothB® phone not present or turned OFF. 3. BluetoothB® phone has low battery. 4. The boot procedure for the radio, the phone, or both did not complete successfully. 5. A phone freeze has occurred.	1. Be certain that the phone is BluetoothB® compatible and is paired to the radio. 2. Be sure that the paired phone is present, turned ON, and that the phone's BluetoothB® option is enabled. 3. At low battery levels, some phones will turn OFF BluetoothB® functionality. Be certain that the phone battery is charged to an adequate level. 4. Cycle both the radio and the phone OFF, then ON again in an attempt to complete a successful boot procedure. 5. Power cycle the phone. Refer to the operator's service information for the phone.
PHONE PAIRING FAILED	1. The phone is not BluetoothB® enabled. 2. The phone does not support the BluetoothB® Hands Free Profile.	1. The BluetoothB® transceiver requires that the cellular phone be BluetoothB® enabled. The phone must be upgraded to one that is BluetoothB® enabled. A list of suggested phones is available at: https://www.driveuconnect.com/ 2. The BluetoothB® transceiver requires that the cellular phone support the Hands Free Profile. The phone must be upgraded to one that supports the Hands Free Profile. A list of

HANDS FREE PHONE DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Incorrect discovered BluetoothB® device selected in the phone. 4. The phone's PIN is not the same as the PIN assigned by the radio during pairing. 5. Phone pairing is locked (password protected). 6. The radio has reached the maximum number of allowed devices paired. 7. The phone has reached the maximum number of allowed devices paired. 8. The boot procedure for the radio, the phone, or both did not complete successfully. 9. A phone freeze has occurred.	suggested phones is available at: https://www.driveuconnect.com/ 3. Be certain to select UconnectB® in the discovered BluetoothB® devices in the phone for pairing. 4. The PIN assigned by the radio during pairing must match the PIN of the phone. 5. To unlock phone pairing in the phone, be certain that password protection is turned OFF. 6. Remove one of the previously paired devices from the paired list of the radio. 7. Remove one of the previously paired devices from the phone's paired list or delete the pairing history from the phone. Refer to the operator's service information for the phone. 8. Cycle both the radio and the phone OFF, then ON again in an attempt to complete a successful boot procedure. 9. Perform a hard reset (power cycle) to the phone. Refer to the operator's service information for the phone.
PHONE WILL NOT RECONNECT AFTER PAIRING	1. BluetoothB® settings in the phone are incorrect. 2. Phone pairing is locked (password protected). 3. The boot procedure for the radio, the phone, or both did not complete successfully. 4. A phone freeze has occurred.	1. BluetoothB® settings in the phone should be set to auto-connect or select UconnectB® as a trusted device in the phone. 2. To unlock phone pairing in the phone, be certain that password protection is turned OFF. 3. Cycle both the radio and the phone OFF, then ON again in an attempt to complete a successful boot procedure. 4. Perform a hard reset (power cycle) to the phone. Refer to the operator's service information for the phone.
POOR VOICE RECOGNITION	1. User is not waiting for the beep tone acknowledgement before issuing voice commands. 2. User is not issuing voice commands in a smooth and consistent speaking voice. 3. User is not using proper Voice Recognition (VR) syntax. 4. High noise levels within the passenger compartment.	1. Be certain the user knows to wait for the acknowledgement beep tone before issuing voice commands. 2. Be certain the user is issuing voice commands in a normal, smooth, and consistent speaking voice. The Advanced Speech Recognition (ASR) engine is designed to recognize normal speech patterns and at a normal tone. Some users tend to speak to a computer loud and slow, which results in reduced performance. 3. User must speak using proper VR syntax. 4. ASR engine performance is increased when noise conditions in the passenger compartment are lowered. Ideal conditions include having the

	HANDS FREE PHONE	DIAGNOSIS and the blower fan set to LOW or OFF.
CONDITION	POSSIBLE CAUSES	CORRECTION
	5. Passengers are talking while the user is attempting to issue a voice command. 6. Foreign objects interfering with microphone input. 7. The microphone is not properly attached to the header trim. 8. The incorrect UconnectB® switch button is being pressed. 9. Microphone failure.	5. Although designed to focus on sounds from the driver seated position, the directional microphone will pick up sounds from any seating position in the vehicle. ASR engine performance is increased in low noise environments. 6. Verify that no foreign objects obstruct the microphones in the header trim that could interfere with microphone reception. 7. The microphones must be firmly mounted to the header trim. Be certain the microphone is installed correctly. 8. Phone features are accessed using the UconnectB® Phone button on the steering wheel or the Phone soft key in the radio display. Other UconnectB® Voice Recognition features are accessed using the UconnectB® VR button or soft key. 9. Use a diagnostic scan tool and the appropriate diagnostic procedures for additional diagnosis of the microphone.
PHONE BOOK DOES NOT DOWNLOAD	1. Phone does not support the Phone Book Access Profile (PBAP). 2. Phone book transfer not enabled in the phone during pairing. 3. Missing contacts from the downloaded phone book.	1. The UconnectB® system requires that the cellular phone support the PBAP profile. To enable the UconnectB® phone book download feature, the phone must be upgraded to one that is PBAP enabled. A list of suggested phones is available at: https://www.driveuconnect.com/ 2. Be sure that phone book transfer is accepted or enabled in the phone during pairing to enable the UconnectB® phone book download feature. 3. Only contacts with a phone number are downloaded from the phone, and the number of contacts downloaded is limited to 1000.
PHONE BOOK NAMES NOT RECOGNIZED CONSISTENTLY	1. User is not waiting for the beep tone acknowledgement before issuing voice commands. 2. User is not issuing voice commands in a smooth, and consistent speaking voice. 3. User is not using proper VR syntax. 4. Phone book names too short. 5. Name not spoken by the user as it appears in the phone book.	1. Be certain the user knows to wait for the acknowledgement beep tone before to issuing voice commands. 2. Be certain the user is issuing voice commands in a normal, smooth and consistent speaking voice. The Advanced Speech Recognition (ASR) engine is designed to recognize normal speech patterns and at a normal tone. Some users tend to speak to a computer loud and slow, which results in reduced performance. 3. User must speak using proper VR syntax (for example: say Call - then the name, or say Dial - then the number). 4. For increased performance, it is recommended to use both first and last names for phone book entries. Example: Daniel Johnson as opposed to Dan . 5. Speak the full contact name as it appears in the phone book. Do not use nicknames.

HANDS FREE PHONE DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
	6. Multiple similar sounding names in the phone book. 7. Phone book download not yet completed. 8. High noise levels within the passenger compartment. 9. Passengers are talking while the user is attempting to issue a voice command. 10. Foreign objects interfering with microphone input. 11. The microphone is not properly attached to the header trim. 12. The incorrect UconnectB® switch button is being pressed. 13. Microphone failure.	6. For increased performance, it is recommended that the user does not enter similar sounding names in the phone book. 7. Depending upon the size of the contact list on the phone, the download may not have had time to complete. If the Phone Book button on the radio phone screen appears greyed out, the contact list download is still in progress. Wait until the download completes. 8. ASR engine performance is increased when noise conditions in the passenger compartment are lowered. Ideal conditions include having the windows closed and the blower fan set to LOW or OFF. 9. Although designed to focus on sounds from the driver seated position, the directional microphone will pick up sounds from any seating position in the vehicle. ASR engine performance is increased in low noise environments. 10. Verify that no foreign objects obstruct the microphones in the header trim that could interfere with microphone reception. 11. The microphones must be firmly mounted to the header trim. Be certain the microphone is installed correctly. 12. Phone features are accessed using the UconnectB® Phone button on the steering wheel or the Phone soft key in the radio display. Other UconnectB® Voice Recognition features are accessed using the UconnectB® VR button or soft key. 13. Use a diagnostic scan tool and the appropriate diagnostic procedures for additional diagnosis of the microphone.
POOR PHONE AUDIO QUALITY	1. High noise levels within the passenger compartment. 2. Passengers are talking while the user is attempting to issue a voice command. 3. Foreign objects interfering with microphone input. 4. The microphone is not properly attached to the header trim. 5. Microphone failure.	1. ASR engine performance is increased when noise conditions in the passenger compartment are lowered. Ideal conditions include having the windows closed and the blower fan set to LOW or OFF. 2. Although designed to focus on sounds from the driver seated position, the directional microphone will pick up sounds from any seating position in the vehicle. ASR engine performance is increased in low noise environments. 3. Verify that no foreign objects obstruct the microphones in the header trim that could interfere with microphone reception. 4. The microphones must be firmly mounted to the header trim. Be certain the microphone is installed correctly. 5. Use a diagnostic scan tool and the appropriate diagnostic procedures for additional diagnosis of

HANDS FREE PHONE DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
		the microphone.
NO PHONE AUDIO	1. The settings in the phone cause the phone audio to be routed to a handset.	1. Route the phone audio to the hands free device.
CALL LOG INOPERATIVE OR INACCURATE	1. Call log not supported by the phone. 2. The phone is not providing accurate call log data.	1. The UconnectB® system requires that the cellular phone support the call log feature. To enable the UconnectB® call log feature, the phone must be upgraded to one that is call log enabled. A list of suggested phones is available at: https://www.driveuconnect.com/ 2. Refer to the operator's service information for the phone.
AUDIO OUTPUT TOO LOW	1. Volume setting on the BluetoothB® device set too low. 2. Volume setting on the radio is set too low.	1. Set the phone or other BluetoothB® device's volume to about three quarters (3/4) of full or maximum volume. 2. Set the radio volume to the desired level during an active UconnectB® Hands Free Phone call session.

NAVIGATION

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

For information on diagnosing the GPS satellite navigation system, use the **POOR OR NO GPS RECEPTION** test. Refer to **DIAGNOSIS AND TESTING**.

The hardwired circuits between components related to the radio and the UconnectB® Navigation system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, wire harness routing and retention, connector pin-out information, and location views for the various wire harness connectors, splices, and grounds. For proper wire repair, and connector repair procedures. Refer to **STANDARD PROCEDURE** . and. Refer to **REMOVAL** . Refer to **INSTALLATION** .

However, conventional diagnostic methods will not prove conclusive in diagnosing the radio or the electronic controls and communication between modules and other devices that provide some features of the UconnectB® Navigation system. The most reliable, efficient, and accurate means to diagnose the radio or the electronic controls and communication related to UconnectB® Navigation system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

UCONNECT + SIRIUSXM GUARDIAN

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor

to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The hardwired circuits between components related to the radio and the UconnectB® + SiriusXMB® Guardian™ system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the radio or the electronic controls and communication between modules and other devices that provide some features of the UconnectB® + SiriusXMB® Guardian™ system.

A Light Emitting Diode (LED) indicator on each push button provides an indication of the status of the UconnectB® + SiriusXMB® Guardian™ embedded cellular device. Any fault indication is accompanied by a pop up screen in the radio electronic touch screen display. The following indications are provided whenever the status of the ignition switch is ON or Accessory (ACC):

- **Solid Green** - No active call.
- **Flashing Green** - A UconnectB® Care or SOS call is active.
- **Solid Red** - A Controller Area Network (CAN), embedded cellular device, cellular antenna or wiring fault has been detected.
- **Off** - No power supply to the rear view mirror.

In addition to the LED indicator on the mirror, one of the following error messages may appear in the radio touchscreen display. These error messages will coincide with a solid red mirror LED indication.

- **Critical VIN Error** - This message typically indicates the radio data was not provisioned with the back end database, or that critical data within the radio is missing. Diagnosis of this type of failure will require the assistance of the network provider.

1. Enter the **Dealer Mode** menu using one of three methods, depending on the radio in the vehicle.

NOTE: ***The preferred method of recording the information requested below for the UconnectB® Care network engineer is to take a picture of each screen using a cellphone camera to transfer that picture to the network engineer (or Star agent).**

- **Method One**

With the radio ON, enter the **Dealer Mode** menu by selecting the driver temperature up, temperature down, and front defrost buttons simultaneously until the menu appears (about 5-8 seconds).

- **Method Two**

With the radio ON, enter the **Dealer Mode** menu by pressing the SCREEN OFF button, then immediately lightly press both lower corners of the display screen until the menu appears (about 5-10 seconds).

- **Method Three**

With the radio ON, enter the **Dealer Mode** menu by pressing the SCREEN OFF button, then immediately lightly press the lower left and upper right corners of the display screen until the menu appears (about 5-10 seconds).

1. Navigate through the **System Information** menu to the **Radio Part Information** menu.

2. *Write down/photograph the **Serial Number** , **Software Version** and **Application Version** (as applicable to the radio in the vehicle) listed on the **Radio Part Information** menu. The serial number begins with a **T** .
2. Navigate back to the **Dealer Mode** menu.

The network engineer will need the connectivity information which is dependant on the radio in the vehicle. The method of obtaining this information is by using one of two methods:

Method One

1. Navigate through the **##Menu Basic** menu to the **##RTN#** menu.
2. *Write down/photograph the **MDN** number listed on the **##RTN#** menu.
3. *Write down/photograph the **MEID** number listed on the **##RTN#** menu.

Method Two

1. Navigate through the **Service Information** menu to the **Connectivity (Information)** menu.
 2. *Write down/photograph the **MSISDN** number listed on the **Connectivity (Information)** menu.
 3. *Write down/photograph the **IMEI** number listed on the **Connectivity (Information)** menu.
 4. *Write down/photograph the **ICCID** number listed on the **Connectivity (Information)** menu.
3. Place a call to UconnectB® Care. Provide your dealer code, name, call back number and the Vehicle Identification Number (VIN). Request a ticket be opened with the network engineers to assist with UconnectB® + SiriusXMB® Guardian™ diagnostics. A ticket will be opened with the network engineers and a call back will occur within 15 minutes for additional assistance and diagnostics. If there is no call back within 15 minutes, create a STAR case and submit the pictures and information along with scan and configuration reports.
- **Vehicle Phone Requires Service** - This message can indicate a fault with the antenna, the inside rear view mirror, communication with the Occupant Restraint Controller (ORC) module or any of the hardwired circuits between these components. Check for an active or stored Diagnostic Trouble Code (DTC) for any of the listed components. Follow all of the steps found in the diagnostic information for the retrieved DTC and fully check the hardwired circuitry associated with the DTC. If no DTC can be retrieved, an internal failure within the radio may exist.

NOTE: Validation and diagnosis of many of the conditions listed below will require access to both the paired BluetoothB® device and the Personal Identification Number (PIN) required for that device.

UCONNECTB® + SIRIUSXMB® GUARDIAN™ DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
POOR VOICE RECOGNITION	1. User is not waiting for the beep tone acknowledgement before issuing voice commands. 2. User is not issuing voice commands in a smooth and consistent speaking voice. 3. User is not using proper Voice Recognition (VR) syntax.	1. Be certain the user knows to wait for the acknowledgement beep tone prior to issuing voice commands. 2. Be certain the user is issuing voice commands in a normal, smooth and consistent speaking voice. The Advanced Speech Recognition (ASR) engine is designed to recognize normal speech patterns and at a normal tone. Some users tend to speak to a computer loud and slow, which results in reduced performance. 3. User must speak using proper VR syntax.

UCONNECTB® + SIRIUSXMB® GUARDIAN™ DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
	4. High noise levels within the passenger compartment. 5. Passengers are talking while the user is attempting to issue a voice command. 6. Foreign objects interfering with microphone input. 7. The microphone is not properly attached to the header trim. 8. The incorrect UconnectB® switch button is being pressed. 9. Microphone failure.	4. ASR engine performance is increased when noise conditions in the passenger compartment are lowered. Ideal conditions include having the windows closed and the blower fan set to LOW or OFF. 5. Although designed to focus on sounds from the driver seated position, the directional microphones will pick up sounds from any seating position in the vehicle. ASR engine performance is increased in low noise environments. 6. Verify that there are no foreign objects obstructing the microphones in the header trim that could be interfering with microphone reception. 7. The microphones must be firmly mounted to the header trim. Be certain the microphone is properly installed. 8. Phone features are accessed using the UconnectB® Phone button on the steering wheel or the Phone soft key in the radio display. Other UconnectB® Voice Recognition features are accessed using the UconnectB® VR button or soft key. 9. Use a diagnostic scan tool and the appropriate diagnostic procedures for additional diagnosis of the microphone.
REMOTE SERVICES INOPERATIVE	1. UconnectB® + SiriusXMB® Guardian™ registration incomplete. 2. Phone is not compatible. 3. UconnectB® + SiriusXMB® Guardian™ subscription service is inactive in the radio. 4. Cellular antenna issue. 5. Radio Frequency Hub (RFH) Module issue.	1. Select the Apps soft key in the radio display, then select the UconnectB® + SiriusXMB® Guardian™ Registration App soft key from the Apps list. For additional assistance press the ASSIST button on the inside rear view mirror to contact UconnectB® Customer Care. 2. Be certain that the phone is compatible and is paired to the radio. A list of suggested phones is available at: https://www.driveuconnect.com. 3. This feature is only available with the UconnectB® + SiriusXMB® Guardian™ subscription service. Be certain that the subscription service account is active in the radio. 4. Refer to the Audio And Video System service information for additional diagnosis of the cellular (combination) antenna. 5. Additional diagnosis of the RFH requires the use of a diagnostic scan tool and the appropriate diagnostic procedures.
AUDIO OUTPUT TOO LOW	1. Volume setting on BluetoothB® device set too low. 2. Volume setting on the radio.	1. Set the volume of the phone or other BluetoothB® device to about three quarters (3/4) of full or maximum volume. 2. Set the volume of the radio to the desired level during an active UconnectB® Access feature session.

UCONNECTB® + SIRIUSXMB® GUARDIAN™ DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
UCONNECTB® + SIRIUSXMB® GUARDIAN INOPERATIVE - NO GREEN OR RED LED INDICATOR	1. Status of ignition switch is OFF. 2. Inside rear view mirror wiring not connected. 3. Ineffective ground circuit. 4. Ineffective feed circuit.	1. Ignition switch status must be ON or ACCESSORY during UconnectB® + SiriusXMB® Guardian™ operation. 2. Be certain the wire harness for the inside rear view mirror is connected and fully engaged. 3. Test and repair the open inside rear view mirror ground circuit if required. 4. Test and repair the open inside rear view mirror feed circuit if required.
UCONNECTB® + SIRIUSXMB® GUARDIAN INOPERATIVE - GREEN LED INDICATOR	1. UconnectB® + SiriusXMB® Guardian™ registration incomplete. 2. UconnectB® + SiriusXMB® Guardian™ subscription service is inactive in the radio. 3. UconnectB® + SiriusXMB® Guardian™ application (app) corrupt or improperly installed.	1. Select the Apps soft key in the radio display, then select the UconnectB® + SiriusXMB® Guardian™ Registration App soft key from the Apps list. For assistance press the ASSIST button on the inside rear view mirror to contact UconnectB® Customer Care. 2. Many UconnectB® + SiriusXMB® Guardian™ features are only available with the UconnectB® + SiriusXMB® Guardian™ subscription service. Be certain that the subscription service account is active in the radio. 3. Perform the UconnectB® + SiriusXMB® Guardian™ System Reinstall Applications Standard Procedure. Refer to <u>UCONNECT + SIRIUSXM GUARDIAN SYSTEM - REINSTALL APPLICATIONS</u>.
UCONNECTB® + SIRIUSXMB® GUARDIAN INOPERATIVE - RED LED INDICATOR	1. Loss of CAN - Interior High Speed (CAN-IHS) or CAN-Chassis (CAN-C) communication. 2. Cellular antenna issue. 3. Ineffective embedded cellular device.	1. Additional diagnosis of CAN-IHS or CAN-C communication requires the use of a diagnostic scan tool and the appropriate diagnostic procedures. 2. Refer to the Audio And Video System service information for additional diagnosis of the cellular (combination) antenna. 3. Additional diagnosis of the radio requires the use of a diagnostic scan tool and the appropriate diagnostic procedures. Test and replace the radio, if required.

STANDARD PROCEDURE

NAVIGATION SYSTEM - RESTORE OR UPDATE

Navigation System map and Point-Of-Interest (POI) data updates for North American Free Trade Agreement (NAFTA) vehicles may become available occasionally through the HERE website (http://chryslergroup.navigation.com/home/en_US/ChryslerNA/USD). Updates in non-NAFTA markets can be obtained at an authorized dealer. The updated information and some additional feature applications can be downloaded and copied to Universal Serial Bus (USB) media for transfer and installation to the navigation module within the radio in the vehicle. These are fee-based applications and updates, which are made at the option and expense of the customer.

However, a new radio is equipped with only a standard base version of the map and POI data. Before the dealer replaces an original radio with a new unit, the version of the map and POI data on the original radio must be noted. If the version of the map and POI data found on the new radio is not equal to or newer than the version

that was found on the replaced radio. Updated data will need to be downloaded and installed on the new radio at the dealer's expense.

UCONNECT + SIRIUSXM GUARDIAN SYSTEM - REINSTALL APPLICATIONS

NOTE: The following procedure may assist the dealer technician in diagnosis by reloading the applications for which the vehicle owner or operator has valid subscriptions. The reloading procedure is primarily used to troubleshoot any application provisioning or data corruption issues. The reinstallation process may take up to 30 minutes, depending upon the number of apps and the cellular signal strength seen on the radio's Apps orb. Also, reinstalling applications may correct a Digital Rights Management (DRM) concern that is causing a No Subscription error for fully registered customers. This process may also help force DRM synchronization following a software or firmware update.

The Reinstall Applications procedure can only be initiated from the touchscreen of the radio.

During this procedure, the subscribed applications are removed from the radio and reinstalled based upon data found on the cloud server. The applications reinstalled to the radio will be based upon valid subscriptions and are referred to as Digital Rights.

1. Navigate through the **Apps > Uconnect Store > My Apps > Settings** on the radio touchscreen.
2. Select **Reinstall Apps**.
3. Press the **Continue** soft key to initiate the Reinstall Applications procedure or press the **Help** soft key for more information.
4. When the **Apps reinstalled. The radio will restart shortly.** The screen appears, press the **OK** soft key.
5. Once the request is processed, a screen will alert the customer with the message, **Important: Application Data Reset Initiated. After Radio Resets, all application data will be lost. Please Wait.** After the radio reset occurs, the apps will begin to be reinstalled. The reinstallation process may take up to 30 minutes, depending upon the number of apps and the cellular signal strength seen with the bar graph on the **Apps** soft key orb in the lower right corner of the radio touchscreen.

NOTE: One or two ignition cycles (including bus time-outs) may speed the reloading process following the radio reset.

UCONNECTB® + SIRIUSXMB® GUARDIAN™ SYSTEM - REMOVE ACCOUNTS

INFORMATION ONLY

NOTE: The following procedure is provided to the dealer technician as information only, intended for use by the vehicle owner or operator.

This procedure is used when selling the vehicle or canceling the UconnectB® + SiriusXMB® Guardian™ account. Removing the account will disassociate the Vehicle Identification Number (VIN) from the account and remove UconnectB® + SiriusXMB® Guardian™ features from the vehicle.

The UconnectB® + SiriusXMB® Guardian™ features can be reinstated by repeating the registration process through the radio and following the directions associated with registering for UconnectB® Access.

The Remove Accounts procedure can only be initiated by the owner calling the SiriusXMB® Guardian™ Customer Care center at 1-844-796-4827.

ANTENNA, LONG-TERM EVOLUTION 1 (LTE1)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CELLULAR ANTENNA

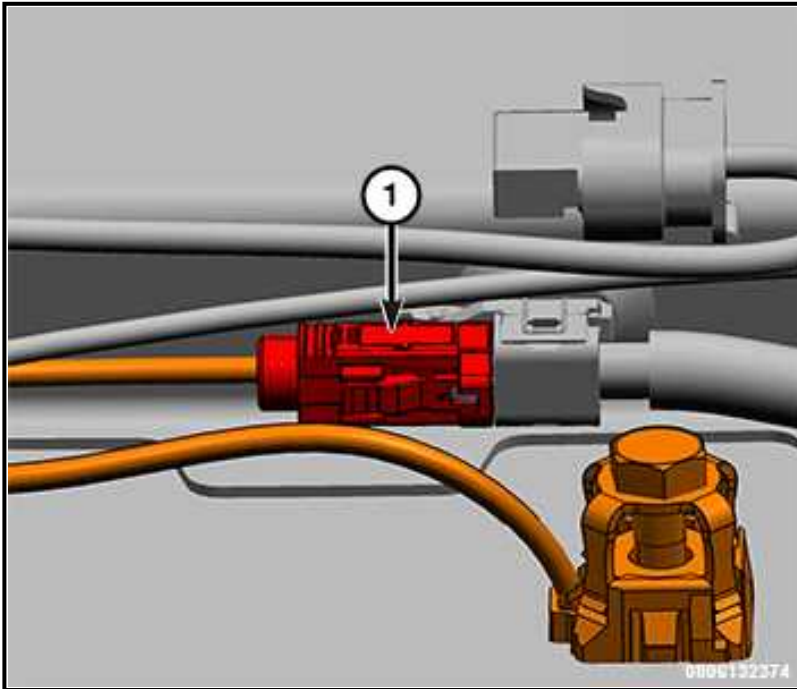
For information on diagnosing the Long Term Evolution (LTE) Cellular Antenna system, use the **POOR OR NO CELLULAR RECEPTION** test. Refer to [DIAGNOSIS AND TESTING](#) .

REMOVAL AND INSTALLATION

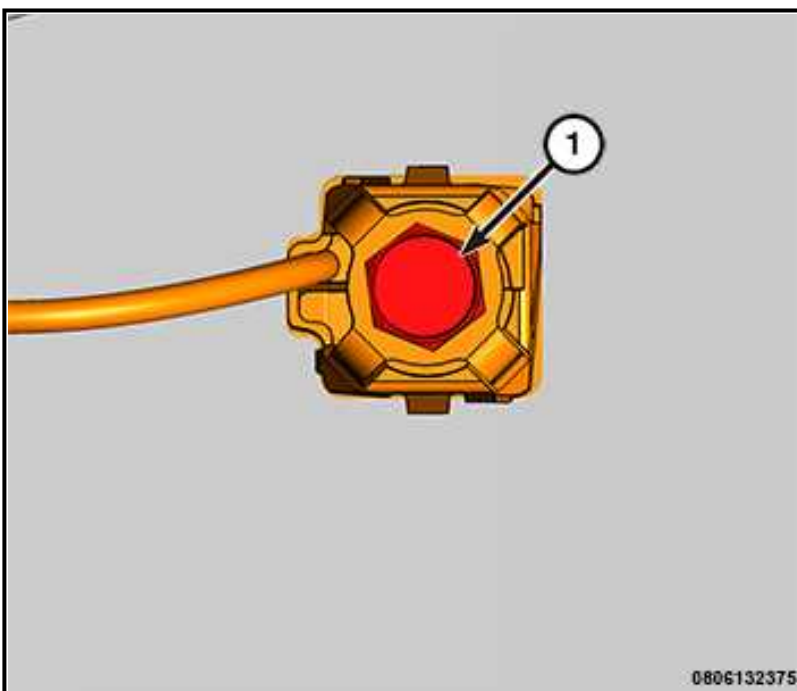
REMOVAL AND INSTALLATION

REMOVAL

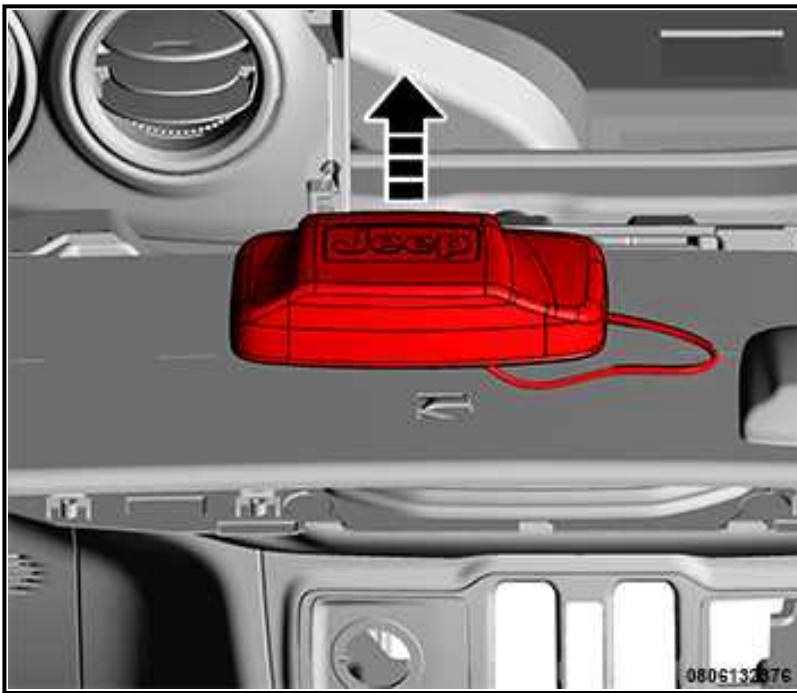
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the sport bar speaker pod assembly. Refer to [BAR, SPORT, SPEAKER POD, REMOVAL AND INSTALLATION](#) .



3. Disconnect the wire harness connector (1) from the Long Term Evolution 1 (LTE1) antenna.



4. Remove the LTE1 antenna fastener (1).



5. From inside the vehicle, and using a flat bladed tool, press one of the plastic retaining tabs on the antenna stud. Push up on one side of the LTE1 antenna stud and press the other plastic retaining tab, then remove the LTE1 antenna from the sport bar.

INSTALLATION

NOTE: A NEW silver clip (with four legs) must be used if the same antenna is being re-installed.

1. Insert the wire harness through hole in the middle sports bar. Press the LTE1 antenna into position until the retainers on the LTE1 antenna stud and the locator stud engage into position.
2. Install the LTE1 antenna fastener and tighten securely.
3. Connect the wire harness connector to the LTE1 antenna.
4. Install the sport bar speaker pod assembly. Refer to [BAR, SPORT, SPEAKER POD, REMOVAL AND INSTALLATION](#).
5. Connect the negative battery cable(s). Refer to the appropriate service information.

ANTENNA, LONG-TERM EVOLUTION 2 (LTE2)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CELLULAR ANTENNA

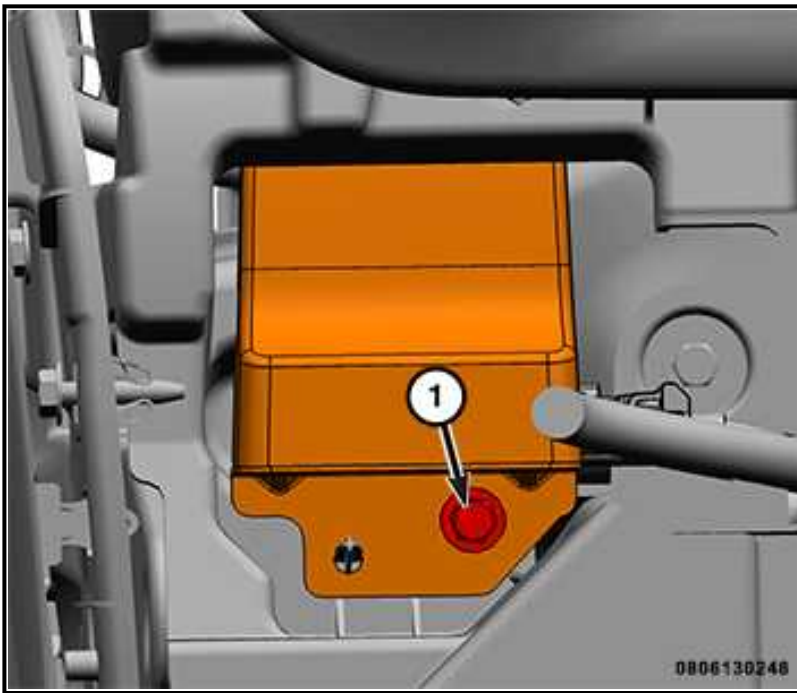
For information on diagnosing the Long Term Evolution (LTE) Cellular Antenna system, use the **POOR OR NO CELLULAR RECEPTION** test. Refer to [DIAGNOSIS AND TESTING](#).

REMOVAL AND INSTALLATION

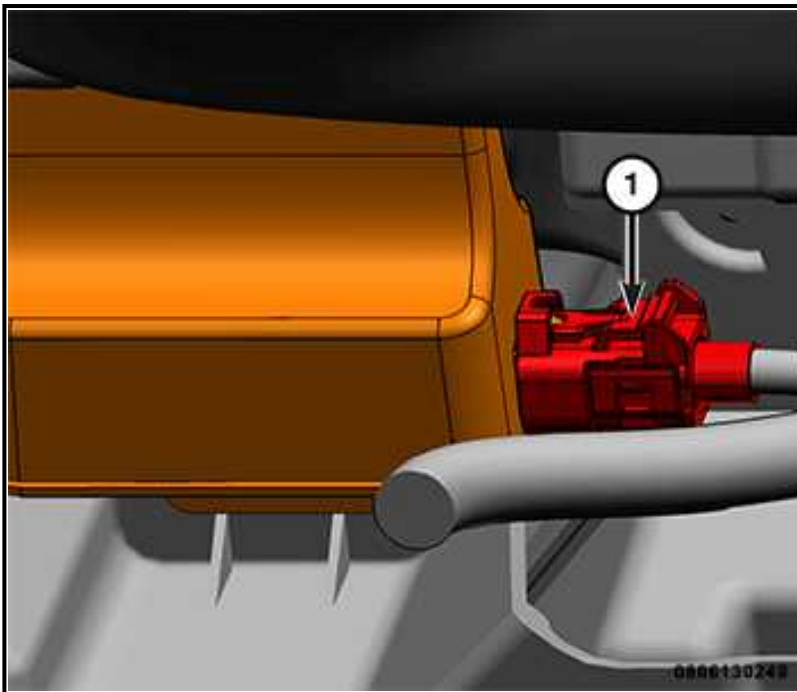
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information.
2. Remove the driver side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#).



3. Remove the fastener (1) securing the Long Term Evolution 2 (LTE2) antenna to the instrument panel.



4. Disconnect the wire harness connector (1) and remove the LTE2 antenna from the instrument panel.

INSTALLATION

1. Connect the wire harness connector to the LTE2 antenna.
2. Position the LTE2 antenna to the instrument panel, then install the fastener and tighten securely.
3. Install the driver side instrument panel cover. Refer to [COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

ANTENNA, NAVIGATION

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING

For information on diagnosing the Global Positioning System (GPS) satellite navigation system, use the **POOR OR NO GPS RECEPTION** test. Refer to [**DIAGNOSIS AND TESTING**](#) .

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The navigation antenna and the satellite antenna are serviced as a unit. The Satellite Digital Audio Radio Service (SDARS)/Global Positioning System (GPS) antenna is located on the top of the sports bar. Refer to [**ANTENNA, SATELLITE, AUDIO, REMOVAL AND INSTALLATION**](#) .

MICROPHONE

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING

WARNING:

To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

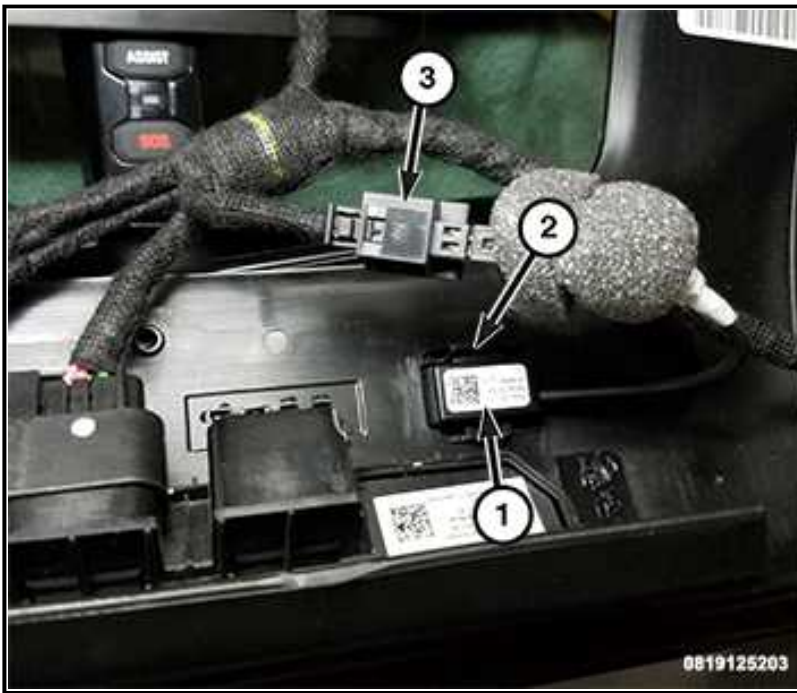
The hardwired inputs and outputs of the microphones in the upper windshield header trim just above the rearview mirror may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in diagnosing the microphones or the electronic controls and communication between modules and other devices that provide some features of the radio controlled microphones. The most reliable, efficient, and accurate means to diagnose the radio or the electronic controls and communication related to radio controlled microphone operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the header panel. Refer to [**PANEL, HEADER, REMOVAL AND INSTALLATION**](#) .



3. Pull back the foam covering the microphone wire harness (3) connector and disconnect the wire harness connector.
4. Disengage the retainer (2) securing the microphone (1) to the header panel.
5. Remove the microphone (1) from the vehicle.

INSTALLATION

1. Position the microphone to the header panel.
 2. Install the microphone and carefully engage the retainer.
 3. Connect the microphone wire harness connector and reposition the foam over the wire harness connector.
 4. Install the header panel. Refer to [**PANEL, HEADER, REMOVAL AND INSTALLATION**](#) .
 5. Connect the negative battery cable(s). Refer to the appropriate service information .
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2021 ACCESSORIES AND EQUIPMENT

(Occupant Classification Module (OCM) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B0052-01</u>	PASSENGER SEATBELT SENSOR-GENERAL ELECTRICAL FAILURE
<u>B0061-13</u>	PASSENGER SEATBELT TENSION SENSOR-CIRCUIT OPEN
<u>B0061-16</u>	PASSENGER SEATBELT TENSION SENSOR-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B0061-17</u>	PASSENGER SEATBELT TENSION SENSOR-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B0061-2A</u>	PASSENGER SEATBELT TENSION SENSOR-STUCK
<u>B1B9D-00</u>	BLADDER FLUID LEVEL LOW
<u>B1BA8-00</u>	SYSTEM OUT OF CALIBRATION/NOT CALIBRATED
<u>B1C31-00</u>	OCCUPANT CLASSIFICATION CALIBRATION RANGE PERFORMANCE
<u>B2206-00</u>	CURRENT VIN MISSING-MISMATCH
<u>B2212-00</u>	OCCUPANT CLASSIFICATION MODULE INTERNAL
<u>B222A-00</u>	VEHICLE LINE MISMATCH
<u>U0001-00</u>	HIGH SPEED CAN COMMUNICATION BUS
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0151-00</u>	LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

DIAGNOSIS AND TESTING

B0052-01-PASSENGER SEATBELT SENSOR-GENERAL ELECTRICAL FAILURE

For a complete RESTRAINT SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

When powered, the Occupant Restraint Controller (ORC) sends a test current across the Passenger Seat Belt Buckle Switch circuits every 100 ms to verify the integrity of the switch and wiring. The front seat belt switches cannot be adjusted or repaired and, if ineffective or damaged, the entire front seat belt buckle-half unit must be replaced. The airbag warning lamp will display in the instrument cluster for this fault.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- While the ignition is on, the Occupant Classification Module (OCM) monitors the Passenger Seat Buckle Switch status provided by the ORC and sets this DTC. The OCM monitors the ORC status at power up and continuously every 100ms.

DEFAULT ACTION

- This DTC may or may not modify deployment strategy during a crash event.

POSSIBLE CAUSES

Possible Causes
PASSENGER SEATBELT BUCKLE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read ORC DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read ORC DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the RESTRAINTS SYSTEM INTERMITTENT TEST. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK THE SWITCH CIRCUITS FOR SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit(s) by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit(s) being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit(s) being tested at the component harness connector and check for continuity between the circuit(s) and ground.

Is there continuity between ground and either circuit?

Yes

- Repair the switch circuit(s) for a short to ground.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE SWITCH CIRCUITS FOR A SHORT TOGETHER

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

Is there continuity between the switch circuits?

Yes

- Repair the short between the switch circuits.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [**RESTRAINTS SYSTEM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE SWITCH CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms on either circuit?

Yes

- Go To [5](#)

No

- Repair the switch circuit(s) for an open or high resistance.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [**RESTRAINTS SYSTEM VERIFICATION TEST**](#) .

5. CHECK THE SWITCH CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present on either circuit?

Yes

- Repair the switch circuit(s) for a short to voltage.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [**RESTRAINTS SYSTEM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. REPLACE THE AFFECTED SWITCH

1. Replace the affected switch in accordance with Service Information. Refer to [**BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION**](#) .

2. Connect any connectors removed during testing.
3. Turn the ignition on.
4. Clear DTC and note if it returns.

Did the DTC return?

No

- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to **RESTRAINTS SYSTEM VERIFICATION TEST** .

Yes

- Diagnose and repair any related Occupant Restraint Controller DTCs.

B0061-13-PASSENGER SEATBELT TENSION SENSOR-CIRCUIT OPEN

For a complete RESTRAINT SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Seatbelt Tension Sensor (BTS) is for detecting the magnitude of a tensile force in a seat belt used in a car seat, and in particular a sensor that can detect the magnitude of tension in a seat belt and provide an electrical signal that is representative of the magnitude of tensile force.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- While the ignition is on, the Occupant Classification Module (OCM) monitors the Seatbelt Tension Sensor input and will set this DTC if found to be out of range. The OCM monitors the sensor input status at power up and continuously every 100ms and will set this fault after 3 seconds.

DEFAULT ACTION

- This DTC may or may not modify deployment strategy during a crash event.

POSSIBLE CAUSES

Possible Causes
PASSENGER BTS CIRCUIT(S) OPEN OCCUPANT CLASSIFICATION MODULE (OCM))

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.**

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read ORC DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.

4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read ORC DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the RESTRAINTS SYSTEM INTERMITTENT TEST. Refer to [RESTRAINTS SYSTEM INTERMITTENT TEST](#) .

2. CHECK THE SENSOR CIRCUITS FOR AN OPEN OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms on either circuit?

Yes

- Go To [3](#)

No

- Repair the sensor circuit(s) for an open or high resistance.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

3. REPLACE THE AFFECTED SENSOR

1. Replace the affected sensor in accordance with Service Information. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .
2. Connect any connectors removed during testing.
3. Turn the ignition on.
4. Clear DTC and note if it returns.

Did the DTC return?

No

- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to [MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION](#) .

- Perform the Occupant Classification Module (OCM) Verification Test. Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST**.

B0061-16-PASSENGER SEATBELT TENSION SENSOR-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete RESTRAINT SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Seatbelt Tension Sensor (BTS) is for detecting the magnitude of a tensile force in a seat belt used in a car seat, and in particular a sensor that can detect the magnitude of tension in a seat belt and provide an electrical signal that is representative of the magnitude of tensile force.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- While the ignition is on, the Occupant Classification Module (OCM) monitors the Seatbelt Tension Sensor input and will set this DTC if found to be out of range. The OCM monitors the sensor input status at power up and continuously every 100ms and will set this DTC after 3 seconds.

DEFAULT ACTION

- This DTC may or may not modify deployment strategy during a crash event.

POSSIBLE CAUSES

Possible Causes
PASSENGER BTS CIRCUIT(S) SHORTED TO GROUND, TOGETHER OR BTS VOLTAGE REFERENCE LINE OPEN OCCUPANT CLASSIFICATION MODULE (OCM))

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.**

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read ORC DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read ORC DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the RESTRAINTS SYSTEM INTERMITTENT TEST. Refer to [RESTRAINTS SYSTEM INTERMITTENT TEST](#) .

2. CHECK THE SENSOR CIRCUITS FOR SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit(s) by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit(s) being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit(s) being tested at the component harness connector and check for continuity between the circuit(s) and ground.

Is there continuity between ground and either circuit?

Yes

- Repair the sensor circuit(s) for a short to ground.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE SENSOR CIRCUITS FOR A SHORT TOGETHER

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

Is there continuity between the switch circuits?

Yes

- Repair the short between the sensor circuits.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE AFFECTED SENSOR

1. Replace the affected sensor in accordance with Service Information. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .
2. Connect any connectors removed during testing.
3. Turn the ignition on.
4. Clear DTC and note if it returns.

Did the DTC return?

No

- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to **MODULE, OCCUPANT CLASSIFICATION (OCM), REMOVAL AND INSTALLATION** .
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST**.

B0061-17-PASSENGER SEATBELT TENSION SENSOR-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete RESTRAINT SYSTEMS wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Seatbelt Tension Sensor (BTS) is for detecting the magnitude of a tensile force in a seat belt used in a car seat, and in particular a sensor that can detect the magnitude of tension in a seat belt and provide an electrical signal that is representative of the magnitude of tensile force.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- While the ignition is on, the Occupant Classification Module (OCM) monitors the Seatbelt Tension Sensor input and will set this DTC if found to be out of range. The OCM monitors the sensor input status at power up and continuously every 100ms and sets this DTC after 3 seconds.

DEFAULT ACTION

- This DTC may or may not modify deployment strategy during a crash event.

POSSIBLE CAUSES

Possible Causes
PASSENGER BTS CIRCUIT(S) SHORTED TOGETHER OR OPEN OCCUPANT CLASSIFICATION MODULE (OCM))

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.**

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read ORC DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read ORC DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the RESTRAINTS SYSTEM INTERMITTENT TEST. Refer to [RESTRAINTS SYSTEM INTERMITTENT TEST](#) .

2. CHECK THE SENSOR CIRCUITS FOR A SHORT TOGETHER

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

Is there continuity between the switch circuits?

Yes

- Repair the short between the sensor circuits.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE SENSOR GROUND FOR AN OPEN CIRCUIT OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the sensor ground circuit for an open or high resistance.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

4. CHECK THE SENSOR CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present on either circuit?

Yes

- Repair the sensor circuit(s) for a short to voltage.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to **RESTRAINTS SYSTEM VERIFICATION TEST** .

No

- Go To **5**

5. REPLACE THE AFFECTED SENSOR

1. Replace the affected sensor in accordance with Service Information. Refer to **BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION** .
2. Connect any connectors removed during testing.
3. Turn the ignition on.
4. Clear DTC and note if it returns.

Did the DTC return?

No

- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to **RESTRAINTS SYSTEM VERIFICATION TEST** .

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to **MODULE, OCCUPANT CLASSIFICATION (OCM), REMOVAL AND INSTALLATION** .
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST** .

B0061-2A-PASSENGER SEATBELT TENSION SENSOR-STUCK

For a complete RESTRAINT SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Seatbelt Tension Sensor (BTS) is for detecting the magnitude of a tensile force in a seat belt used in a car seat, and in particular a sensor that can detect the magnitude of tension in a seat belt and provide an electrical signal that is representative of the magnitude of tensile force.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- While the ignition is on, the Occupant Classification Module (OCM) monitors the Seatbelt Tension Sensor input and will set this DTC if found to be out of range. The OCM monitors the sensor input status at power up and continuously every 100ms and sets this DTC after 25.5 seconds.

DEFAULT ACTION

- This DTC may or may not modify deployment strategy during a crash event.

POSSIBLE CAUSES

Possible Causes
PASSENGER BTS CIRCUIT(S) SHORTED TO GROUND, TOGETHER, OPEN OR HIGH RESISTANCE
PASSENGER SEATBELT BUCKLE
OCCUPANT CLASSIFICATION MODULE (OCM))

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read ORC DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read ORC DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the RESTRAINTS SYSTEM INTERMITTENT TEST. Refer to RESTRAINTS SYSTEM INTERMITTENT TEST.

2. CHECK THE SENSOR CIRCUITS FOR SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit(s) by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit(s) being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit(s) being tested at the component harness connector and check for continuity between the circuit(s) and ground.

Is there continuity between ground and either circuit?

Yes

- Repair the sensor circuit(s) for a short to ground.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to RESTRAINTS SYSTEM VERIFICATION TEST.

No

- Go To [3](#)

3. CHECK THE SENSOR CIRCUITS FOR A SHORT TOGETHER

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

Is there continuity between the switch circuits?

Yes

- Repair the short between the sensor circuits.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to **RESTRAINTS SYSTEM VERIFICATION TEST**.

No

- Go To [4](#)

4. CHECK THE SENSOR GROUND FOR AN OPEN CIRCUIT OR HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuits by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the sensor ground circuit for an open or high resistance.
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to **RESTRAINTS SYSTEM VERIFICATION TEST**.

5. CHECK THE SENSOR CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is there any voltage present on either circuit?

Yes

- Repair the sensor circuit(s) for a short to voltage.

- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. REPLACE THE AFFECTED SENSOR

1. Replace the affected sensor in accordance with Service Information. Refer to [BUCKLE, SEAT BELT, REMOVAL AND INSTALLATION](#) .
2. Connect any connectors removed during testing.
3. Turn the ignition on.
4. Clear DTC and note if it returns.

Did the DTC return?

No

- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to [MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION](#) .
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to [OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST](#).

B1B9D-00-BLADDER FLUID LEVEL LOW

THEORY OF OPERATION

The Occupant Classification Module (OCM) monitors the bladder fluid pressure to determine the occupied or empty state of the passenger seat and verify the operational status of the bladder. To determine the operational status of the bladder the OCM monitors the bladder fluid pressure and temperature. The bladder fluid pressure and temperature are analog measurements and converted to digital counts.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- This DTC will set if the Occupant Classification Module (OCM) detects raw pressure less than 30 counts for more than 60 seconds with temperature above 0B°C (32B°F).

DEFAULT ACTION

- This DTC may or may not inhibit deployment or modify deployment strategy.

POSSIBLE CAUSES

Possible Causes
OCCUPANT CLASSIFICATION MODULE (OCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.

DIAGNOSTIC TEST

Replace the Occupant Classification Module (OCM)

1. Make sure the battery is fully charged.
2. Perform the OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST.
3. With the scan tool, read the OCM DTC's.

Did the scan tool display active or stored B1B9D-00-PASSENGER BLADDER FLUID LEVEL LOW DTC?

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to MODULE, OCCUPANT CLASSIFICATION (OCM), REMOVAL AND INSTALLATION.
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST.

No

- Perform the OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST.

B1BA8-00-SYSTEM OUT OF CALIBRATION/NOT CALIBRATED

THEORY OF OPERATION

The Occupant Classification Module (OCM), seat cushion, bladder and vent are calibrated as one unit in the assembly plant.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- This DTC will set if the OCM has not been calibrated as a pair with the foam at the seat assembly plant.

DEFAULT ACTION

- This DTC may inhibit deployment or modify deployment strategy.

POSSIBLE CAUSES

Possible Causes
OCCUPANT CLASSIFICATION MODULE (OCM) NOT CALIBRATED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.

DIAGNOSTIC TEST

VERIFY ACTIVE DTC

NOTE: Make sure the battery is fully charged.

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
2. Make sure the passenger seat is empty and in the upright position. Make sure the temperature of the seat is between 2B°C(35B°F) and 32B°C(90B°F).
3. The following DTCs will cause the procedure to fail: B0061-17, B0061-16, B0061-13, B0061-2A, B1B9D-00, B2212-00. Follow the instructions for repairing these DTCs before attempting to Perform the OCM System Verification Test.

NOTE: PERFORMING THE OCM SYSTEM VERIFICATION TEST WILL ALLOW THE OCM TO RE-LEARN THE EMPTY SEAT VALUE.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Disconnect the 12-volt battery wait two minutes before proceeding, remove the ORC fuses, connect the 12-volt battery, wait two minutes before proceeding. Cycle the ignition to the On position, then reconnect the ORC fuses. Wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

NOTE: Failure to follow the test instructions or aborting the test causes faults to set when performing the Scan tool Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed, verify that the ignition is in run position. Only press scan tool buttons when directed to do so and perform the scan tool Occupant Classification Module System Verification Test to completion.

4. With the scan tool in OCM, select the Miscellaneous Functions tab on the scan tool, select OCM System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test completes, wait two minutes and then proceed as follows.
5. With the scan tool, read active DTCs.

Does the scan tool display active or stored B1BA8-00-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED active DTC?

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to [MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION](#) .

- Perform the Occupant Classification Module (OCM) Verification Test. Refer to [**OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST**](#).

No

- Perform the Standard Procedure OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to [**OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST**](#).

B1C31-00-OCCUPANT CLASSIFICATION CALIBRATION RANGE PERFORMANCE

THEORY OF OPERATION

The Occupant Classification Module (OCM) will set this DTC when the Re-Learn/Re-Zero Procedure is not completed successfully. Go to the Empty Seat Relearn procedure portion for instructions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- The Occupant Classification Module (OCM) will set this DTC when the Re-Learn/Re-Zero Procedure is not completed successfully

DEFAULT ACTION

- This DTC may or may not inhibit deployment or modify deployment strategy.

POSSIBLE CAUSES

Possible Causes
OCCUPANT CLASSIFICATION MODULE (OCM) NOT CALIBRATED
OCCUPANT CLASSIFICATION MODULE (OCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE**](#).

DIAGNOSTIC TEST

VERIFY ACTIVE DTC

NOTE: Make sure the battery is fully charged.

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
2. Make sure the passenger seat is empty.

3. Before re-zero, check proper installation of the bladder and hose routing. If hose/bladder pinched or kinked, the re-zero may fail. If hose has a kink mark, reorder a new kit. OCM will fail in the field otherwise.
4. Three conditions are necessary for a successful re-zero procedure. The seat temperature must be between 2B°C(35B°F) and 32B°C(90B°F). The seat must be in the vehicle and no weight on the seat cushion. Repair the DTCs that prevent the Empty Seat Relearn procedure from successfully completing (B0061-17, B0061-16, B0061-13, B0061-2A, B1B9D-00, B2212-00).

NOTE: Failure to follow the test instructions or aborting the test causes faults to set when performing the Scan tool Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed, verify that the ignition is in run position. Only press scan tool buttons when directed to do so and perform the scan tool Occupant Classification Module System Verification Test to completion.

5. With the scan tool in OCM, select the Miscellaneous Functions tab on the scan tool, select Empty Seat Value Relearn. Run the test by following the instructions displayed on the scan tool. When the test completes, wait two minutes and then proceed as follows.
6. With the scan tool, read active DTCs.

Does the scan tool display active or stored B1BA8-00-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED active DTCs?

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to **MODULE, OCCUPANT CLASSIFICATION (OCM), REMOVAL AND INSTALLATION**.
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST**.

No

- OCM re-zero procedure complete. Perform the Standard Procedure OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST**.

B2206-00-CURRENT VIN MISSING-MISMATCH

THEORY OF OPERATION

During initialization, the Occupant Classification Module determines if it has received and agrees with the VIN message which is broadcast on the Bus.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- This DTC will set if the Occupant Classification Module (OCM) does not receive the Vehicle Identification Number (VIN) information which is broadcast on the Bus or if VIN is different than that stored in OCM.

DEFAULT ACTION

- This DTC may inhibit deployment or modify deployment strategy.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) DTCS OR COMMUNICATION DTCS
OCCUPANT CLASSIFICATION MODULE (OCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE**](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

NOTE: Diagnose and repair any BCM VIN or Communication DTCs before continuing with this test.

1. Turn the ignition on.
2. With the scan tool, read DTCs.

Does the scan tool display this DTC as active?

Yes

- Verify the correct vehicle configuration is programmed in the BCM.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [**RESTRAINTS SYSTEM VERIFICATION TEST**](#) .

No

- Use the scan tool to read DTCs in all other modules and verify correct OCM part number. If any communication DTCs are present, perform the appropriate diagnostic procedure. Perform any Technical Service Bulletins that apply. If no problems are found, replace the Occupant Classification Module. Refer to [**MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to [**OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST**](#).

B2212-00-OCCUPANT CLASSIFICATION MODULE INTERNAL

THEORY OF OPERATION

The Occupant Classification Module (OCM) performs a self test during initialization and continuously through the ignition cycle to determine if an internal fault is detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- This DTC will set if the OCM detects an internal fault within the module.

DEFAULT ACTION

- This DTC may inhibit deployment or modify deployment strategy.

POSSIBLE CAUSES

Possible Causes
OCCUPANT CLASSIFICATION MODULE (OCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE](#).

DIAGNOSTIC TEST

Replace the Occupant Classification Module (OCM)

1. Make sure the battery is fully charged.
2. Turn the ignition off, wait ten seconds and turn ignition on.
3. With the scan tool, read the OCM DTC.

Did the scan tool display active or stored B2212-00-OCCUPANT CLASSIFICATION MODULE INTERNAL DTC?

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to [MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION](#) .
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to [OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST](#).

No

- Perform the OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to [OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST](#).

B222A-00-VEHICLE LINE MISMATCH

THEORY OF OPERATION

During initialization the Occupant Classification Module (OCM) verifies that the vehicle configuration stored matches the data in the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs during continuously:

- Ignition on.

SET CONDITION

- This DTC will set if the Occupant Classification Module (OCM) determines there is incorrect Vehicle Configuration with the BCM.

DEFAULT ACTION

- This DTC may or may not inhibit deployment or modify deployment strategy.

POSSIBLE CAUSES

Possible Causes
INCORRECT OCCUPANT CLASSIFICATION MODULE (OCM) PART NUMBER
INCORRECT VIN PROGRAMMED INTO THE BCM
OCCUPANT CLASSIFICATION MODULE (OCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE**](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read OCM DTCs and record on the repair order.
2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read OCM DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the RESTRAINTS SYSTEM INTERMITTENT TEST. Refer to [**RESTRAINTS SYSTEM INTERMITTENT TEST**](#) .

2. CHECK BCM COUNTRY CODE AND VEHICLE LINE

1. Using the scan tool, check for the correct Country Code, Vehicle Line, and Body Style.

Does the Vehicle Configuration in the BCM match the Vehicle Configuration in the ORC?

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to [**MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to [**OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST**](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Perform the RESTRAINTS SYSTEM VERIFICATION TEST. Refer to [**RESTRAINTS SYSTEM VERIFICATION TEST**](#) .

U0001-00-HIGH SPEED CAN COMMUNICATION BUS

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform

the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

For a complete CAN C BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Occupant Classification Module (OCM) establishes and maintains communication with the Body Control Module (BCM).

WHEN MONITORED

This diagnostic runs

- With the ignition on
- The battery voltage between 10 and 16 Volts.
- Body Control Module (BCM) is configured correctly.

SET CONDITION

- Bus messages not received from the Body Control Module (BCM).

POSSIBLE CAUSES

Possible Causes
CAN BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
BODY CONTROL MODULE (BCM) POWER AND GROUND
BCM NOT CONFIGURED CORRECTLY
BODY CONTROL MODULE (BCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.**

DIAGNOSTIC TEST

VERIFY DTC IS ACTIVE

1. Turn the ignition on.
2. With the scan tool, read the active DTCs.

Does the scan tool display this DTC as active?

Yes

- **Refer to the appropriate diagnostic information** and perform the NO RESPONSE FROM BCM (BODY CONTROL MODULE) diagnostic procedure.

No

- **Refer to STORED LOST COMMUNICATION DTCS** and perform the Stored Lost Communication DTCs diagnostic procedure.

U0151-00-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete RESTRAINT SYSTEMS wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Occupant Classification Module (OCM) establishes and maintains communication with the Occupant Restraint Controller (ORC).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for at least five seconds.

SET CONDITION

- The Occupant Classification Module (OCM) does not receive any CAN Bus messages from the Occupant Restraint Controller (ORC) for greater than 2.5 seconds for Seat Belt Buckle status goes undetermined.

DEFAULT ACTION

- Features concerning the OCM will not update.

POSSIBLE CAUSES

Possible Causes
OCCUPANT CLASSIFICATION MODULE (OCM) POWERS AND GROUNDS
OCCUPANT CLASSIFICATION MODULE (OCM))
CAN C BUS (+) CIRCUIT OPEN
CAN C BUS (-) CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE.

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: If DTC U0002-00-CAN C BUS OFF PERFORMANCE is set in the Body Control Module (BCM), diagnose this DTC before continuing with this diagnostic procedure.

1. With the scan tool, read the Body Control Module (BCM) DTCs and record on the repair order.

Is the DTC active?

Yes

- Refer to the appropriate diagnostic information and perform the NO RESPONSE FROM ORC (OCCUPANT RESTRAINT CONTROLLER) diagnostic procedure.

No

- Refer to **STORED LOST COMMUNICATION DTCS** and perform the STORED LOST COMMUNICATION DTCS diagnostic procedure.

STANDARD PROCEDURE

OCCUPANT-CLASSIFICATION MODULE INTERMITTENT TEST

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

DIAGNOSTIC INTERMITTENT TEST

1. RECORD AND ERASE ALL RESTRAINT SYSTEM DTCS

1. With the scan tool, record and erase all DTCs from all restraints system modules. Monitor for any active codes as you work through the following steps.
 - Review the code monitored and set conditions for any DTCs that are stored and attempt to reproduce the conditions listed.
 - Wiggle the wiring harness and connectors of the related airbag circuit, sensor, or component.

WARNING: Turn the ignition off disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- Disconnect components and inspect the harness and connectors for damage.
- Reconnect components and ensure they are properly seated.

If equipped with the keyless ignition, use this ignition on warning.

WARNING: Disconnect the 12-volt battery wait two minutes before proceeding, remove the ORC fuses, connect the 12-volt battery, wait two minutes before proceeding. Cycle the ignition to the On position, then reconnect the ORC fuses. Wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

If equipped with the standard key ignition, use this ignition on warning.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- Turn the ignition off.
- Perform any Technical Service Bulletins (TSBs) that may apply.

Was the source of the customer complaint found or did any DTCs appear and stay active?

Yes

- Make the appropriate repairs and either perform the RESTRAINTS SYSTEM VERIFICATION TEST or. Refer to **RESTRAINTS SYSTEM VERIFICATION TEST** . For the appropriate diagnostic procedure, Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [2](#)

2. ATTEMPT TO REPRODUCE THE CONDITION

1. In the event the customer complaint cannot be duplicated due to an intermittent condition in the restraints system, the following may aid in attempting to reproduce the condition.

WARNING: Turn the ignition off, disconnect the battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors related to the stored code or component in question.
- Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.
- Reconnect any disconnected components and harness connectors and ensure they are properly seated.

If equipped with the keyless ignition, use this ignition on warning.

WARNING: Disconnect the 12-volt battery wait two minutes before proceeding, remove the ORC fuses, connect the 12-volt battery, wait two minutes before proceeding. Cycle the ignition to the On position, then reconnect the ORC fuses. Wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

If equipped with the standard key ignition, use this ignition on warning.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- If numerous trouble codes were set, use a schematic and inspect any common ground or supply circuits.

Was the source of the intermittent condition located?

Yes

- Make the appropriate repairs and perform the RESTRAINTS SYSTEM VERIFICATION PROCEDURE. Refer to [RESTRAINTS SYSTEM VERIFICATION TEST](#) .

No

- The problem cannot be found at this time.

RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE

For a complete wiring diagram, refer to appropriate SYSTEM WIRING DIAGRAMS article .

DIAGNOSTIC PRE-TEST

OCCUPANT RESTRAINT SYSTEM

1. Before attempting to repair any restraint system, technicians should be familiar with and fully understand the system operation. Refer to Restraints System Description and Operation for complete details. The

following should be used as a checklist to be completed in its entirety prior to referencing specific Restraints Diagnostic Procedures.

2. FOLLOW THE BASIC OUTLINE SET FORTH IN THE SIX-STEP TROUBLESHOOTING PROCEDURE

1. Verification of complaint.
2. Verification of any related symptoms.
3. Symptom analysis.
4. Problem isolation.
5. Repair of isolated problem.
6. Verification of proper operation.

3. TAKE INTO ACCOUNT CURRENT VEHICLE CONDITION, REPAIR HISTORY, AND TECHNICAL SERVICE BULLETINS (TSBs)

- Verify that there are no outward signs of vehicle damage or effects from a collision that could impact the proper operation of the Restraints system.
- Check for aftermarket vehicle accessories that may have been installed improperly or could interfere with the system.
- Check the vehicle repair history for repairs that may relate to the current condition.
- Check for current Technical Service Bulletins (TSBs) for the Restraints system related to the customer concern. If a TSB applies, follow the procedure outlined in the TSB.

4. DIAGNOSE ONLY THOSE FAILURES THAT ARE ACTIVE AND CAN BE REPRODUCED

- Check the control module central to the subsystem that is exhibiting the condition for active DTCs.
- For an intermittent failure that is not active at the time of vehicle inspection, perform the OCCUPANT CLASSIFICATION MODULE (OCM) INTERMITTENT TEST diagnostic procedure and document the event on the repair order Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST**.

5. ADDRESS ACTIVE DIAGNOSTIC TROUBLE CODES (DTCs) IN THE CORRECT ORDER

1. Low/High Voltage and Serial Data Loss of Communication Codes.
2. Module Internal Failure and Configuration Mismatch Codes.
3. Circuit specific DTC failures.

6. Should the malfunction still be present after conducting this Pre-diagnostic Procedure, technicians should continue to the appropriate DTC procedure Refer to **RESTRAINTS-SYSTEM-PRE-DIAGNOSTIC-PROCEDURE**.

Was the Pre-Test reviewed and is the DTC still present?

Yes

- Perform the appropriate DTC procedure Refer to **DIAGNOSIS AND TESTING**.

No

- Test Complete.

OCM SYSTEM VERIFICATION TEST (EMPTY SEAT RELEARN PROCEDURE)

OCM SYSTEM VERIFICATION TEST (OCM RELEARN PROCEDURE)

OCM SYSTEM VERIFICATION TEST (EMPTY SEAT RELEARN)

NOTE: Make sure the battery is fully charged.

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire

harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
2. Make sure the passenger seat is empty and in the upright position. Make sure the temperature of the seat is lower than 90 degrees F and higher than 35 degrees F.
3. Active B0061-17, B0061-16, B0061-13, B0061-2A, B1B9D-00, B2212-00 DTCs must be repaired before performing Empty Seat Value Relearn procedure.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Disconnect the 12-volt battery wait two minutes before proceeding, remove the ORC fuses, connect the 12-volt battery, wait two minutes before proceeding. Cycle the ignition to the On position, then reconnect the ORC fuses. Wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

NOTE: Failure to follow the test instructions or aborting the test causes faults to set when performing the Scan tool Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed, verify that the ignition is in run position. Only press scan tool buttons when directed to do so and perform the scan tool Occupant Classification Module System Verification Test to completion.

4. Turn the ignition on.
5. With the scan tool in OCM, select the Miscellaneous Functions tab on the scan tool, select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test completes, wait two minutes and then proceed as follows.
6. With the scan tool, read active DTCs.

Does the scan tool display active or stored B1BA8-00-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED active DTC?

Yes

- Replace the Occupant Classification Module (OCM) in accordance with Service Information. Refer to [MODULE, OCCUPANT CLASSIFICATION \(OCM\), REMOVAL AND INSTALLATION](#) .
- Perform the Occupant Classification Module (OCM) Verification Test. Refer to [OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST](#).

No

- OCM re-zero procedure complete. Perform the Standard Procedure OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST. Refer to [OCCUPANT CLASSIFICATION MODULE \(OCM\) VERIFICATION TEST](#).

OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST

DIAGNOSTIC VERIFICATION TEST

DIAGNOSTIC VERIFICATION TEST

NOTE: Follow the ignition off warning, due to any special tools or body harness connectors that may need to be reconnected reintroducing voltage to a wire harness and component area.

WARNING: Turn the ignition off, disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

1. VERIFICATION TEST

2. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the battery.
3. If equipped with the standard key ignition, use this ignition on warning.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

4. If equipped with the keyless ignition, use this ignition on warning.

WARNING: Disconnect the 12-volt battery wait two minutes before proceeding, remove the OCM fuses, connect the 12-volt battery, wait two minutes before proceeding. Cycle the ignition to the On position, then reconnect the OCM fuses. Wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

5. Connect the scan tool to the Data Link Connector - use the most current software available.
6. With the scan tool erase stored DTCs in the Restraint System or whichever subsystem DTCs set.
7. Turn the ignition off, and wait 15 seconds, then turn the ignition on.
8. Wait one minute, using the scan tool read active subsystem DTCs and if there are none present read the stored codes.
9. If the scan tool shows any active or stored codes, follow path specified for that trouble code. If no active or stored codes are present, the repair is complete.

Are any DTCs present or is the original condition still present?

Yes

- Repair is not complete. or whichever subsystem DTC or DTCs set and perform the appropriate diagnostic procedure. Refer to [**DIAGNOSIS AND TESTING**](#).

No

WARNING: Turn the ignition off disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- If equipped with the standard key ignition, use this ignition on warning.

WARNING: Turn the ignition on, then reconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

If equipped with the keyless ignition, use this ignition on warning.

WARNING: Disconnect the 12-volt battery wait two minutes before proceeding, remove the OCM fuses, connect the 12-volt battery, wait two minutes before proceeding. Cycle the ignition to the On position, then reconnect the OCM fuses. Wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

- Perform the OCCUPANT CLASSIFICATION MODULE VERIFICATION TEST. Refer to **OCCUPANT CLASSIFICATION MODULE (OCM) VERIFICATION TEST.**
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2021 ACCESSORIES AND EQUIPMENT

(Park Assist Module (PAM) (PTS/PAM) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1243-2A</u>	REAR PARK ASSIST DISABLE SWITCH-STUCK
<u>B1285-2A</u>	PARK ASSIST - PTS SWITCH-STUCK
<u>B128E-11</u>	PTS-SENSOR-1-CIRCUIT SHORT TO GROUND
<u>B128E-12</u>	PTS-SENSOR-1-CIRCUIT SHORT TO BATTERY
<u>B128E-25</u>	PTS-SENSOR-1-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B128E-92</u>	PTS-SENSOR-1-PERFORMANCE OR INCORRECT OPERATION
<u>B128F-11</u>	PTS SENSOR 2-CIRCUIT SHORT TO GROUND
<u>B128F-12</u>	PTS-SENSOR-2-CIRCUIT SHORT TO BATTERY
<u>B128F-25</u>	PTS-SENSOR-2-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B128F-92</u>	PTS-SENSOR-2-PERFORMANCE OR INCORRECT OPERATION
<u>B1290-11</u>	PTS SENSOR 3-CIRCUIT SHORT TO GROUND
<u>B1290-12</u>	PTS-SENSOR-3-CIRCUIT SHORT TO BATTERY
<u>B1290-25</u>	PTS-SENSOR-3-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1290-92</u>	PTS-SENSOR-3-PERFORMANCE OR INCORRECT OPERATION
<u>B1291-11</u>	PTS SENSOR 4-CIRCUIT SHORT TO GROUND
<u>B1291-12</u>	PTS-SENSOR-4-CIRCUIT SHORT TO BATTERY
<u>B1291-25</u>	PTS-SENSOR-4-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1291-92</u>	PTS-SENSOR-4-PERFORMANCE OR INCORRECT OPERATION
<u>B1292-11</u>	PTS SENSOR 5-CIRCUIT SHORT TO GROUND
<u>B1292-12</u>	PTS-SENSOR-5-CIRCUIT SHORT TO BATTERY
<u>B1292-25</u>	PTS-SENSOR-5-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1292-92</u>	PTS-SENSOR-5-PERFORMANCE OR INCORRECT OPERATION
<u>B1293-11</u>	PTS SENSOR 6-CIRCUIT SHORT TO GROUND
<u>B1293-12</u>	PTS-SENSOR-6-CIRCUIT SHORT TO BATTERY
<u>B1293-25</u>	PTS-SENSOR-6-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1293-92</u>	PTS-SENSOR-6-PERFORMANCE OR INCORRECT OPERATION
<u>B1295-11</u>	PTS SENSOR 8-CIRCUIT SHORT TO GROUND
<u>B1295-12</u>	PTS-SENSOR-8-CIRCUIT SHORT TO BATTERY
<u>B1295-25</u>	PTS-SENSOR-8-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1295-92</u>	PTS-SENSOR-8-PERFORMANCE OR INCORRECT OPERATION
<u>B1296-11</u>	PTS SENSOR 9-CIRCUIT SHORT TO GROUND
<u>B1296-12</u>	PTS-SENSOR-9-CIRCUIT SHORT TO BATTERY
<u>B1296-25</u>	PTS-SENSOR-9-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1296-92</u>	PTS-SENSOR-9-PERFORMANCE OR INCORRECT OPERATION
<u>B1297-11</u>	PTS SENSOR 10-CIRCUIT SHORT TO GROUND
<u>B1297-12</u>	PTS-SENSOR-10-CIRCUIT SHORT TO BATTERY
<u>B1297-25</u>	PTS-SENSOR-10-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1297-92</u>	PTS-SENSOR-10-PERFORMANCE OR INCORRECT OPERATION
<u>B1298-11</u>	PTS SENSOR 11-CIRCUIT SHORT TO GROUND
<u>B1298-12</u>	PTS-SENSOR-11-CIRCUIT SHORT TO BATTERY
<u>B1298-25</u>	PTS-SENSOR-11-SIGNAL SHAPE / WAVEFORM FAILURE
<u>B1298-92</u>	PTS-SENSOR-11-PERFORMANCE OR INCORRECT OPERATION

DTC	Description
<u>B12B2-2A</u>	PARALLEL-PERPENDICULAR PARK ASSIST SWITCH-STUCK
<u>B210C-16</u>	BATTERY VOLTAGE INPUT - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B210C-17</u>	BATTERY VOLTAGE INPUT - CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B21DD-16</u>	SYSTEM VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B21DD-17</u>	SYSTEM VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B222A-00</u>	VEHICLE LINE MISMATCH
<u>B2232-00</u>	(PTS) PARKTRONICS INTERNAL
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0102-00</u>	LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0131-00</u>	LOST COMMUNICATION WITH POWER STEERING CONTROL MODULE "A"
<u>U0137-00</u>	LOST COMMUNICATION WITH TRAILER BRAKE CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0155-00</u>	LOST COMMUNICATION WITH CLUSTER-CCN
<u>U0229-00</u>	LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE
<u>U0401-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ECM-PCM A-OR IMPLAUSIBLE ENGINE SPEED SIGNAL RECIEVED
<u>U0402-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TCM
<u>U0403-00</u>	IMPLAUSIBLE DATA RECEIVED FROM T-CASE
<u>U0415-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ABS
<u>U0420-00</u>	INVALID DATA RECEIVED FROM POWER STEERING CONTROL MODULE "A"
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0423-00</u>	IMPLAUSIBLE DATA RECEIVED FROM CLUSTER-CCN
<u>U0429-00</u>	IMPLAUSIBLE DATA RECEIVED FROM STEERING COLUMN CONTROL MODULE
<u>U0438-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TRAILER CONTROL MODULE

DIAGNOSIS AND TESTING

B1243-2A-REAR PARK ASSIST DISABLE SWITCH-STUCK

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Battery voltage is between 9.6 and 16.6 volts.
- System voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run position and crank delay timer expired.
- U0002-00 DTC not active.

SET CONDITION

- The PAM has received a bussed message from the Integrated Center Stack (ICS) that the Park Assist button is pressed longer than 60 seconds.

DEFAULT ACTION

- Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
DEBRIS IN PARK ASSIST SWITCH
INTEGRATED CENTER STACK (ICS) POD SWITCH BANK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR DEBRIS IN ICS SWITCH BANK

1. Check for debris in ICS switch bank.

Was debris found?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. REMOVE DEBRIS AND RETEST FOR DTCS

1. Turn the ignition off.
2. Remove debris and clean ICS switch pod.
3. Turn the ignition on.

4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED ICS SWITCH BANK HARNESS CONNECTIONS

1. Disconnect all ICS Switch Bank harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ICS Switch Bank harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace ICS POD Switch Bank in accordance with the Service Information. Refer to [MODULE, INTEGRATED CENTER STACK \(ICSM\), REMOVAL AND](#)

INSTALLATION

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1285-2A-PARK ASSIST - PTS SWITCH-STUCK

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Park Assist (PAM) Module supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run position and crank delay timer expired.
- U0002-00 DTC not active.

SET CONDITION

- The PAM has received a bussed message from the Integrated Center Stack (ICS) that the Park Assist button is pressed longer than 60 seconds.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
DEBRIS IN PARK ASSIST SWITCH INTEGRATED CENTER STACK (ICS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE.**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR DEBRIS IN ICS

1. Check for debris in ICS.

Is there debris in ICS?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. REMOVE DEBRIS AND RETEST FOR DTCS

1. Turn the ignition off.
2. Remove debris and clean ICS switch.
3. Turn the ignition on.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED ICS HARNESS CONNECTIONS

1. Disconnect all ICS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ICS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the ICS in accordance with the Service Information. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B128E-11-PTS-SENSOR-1-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects a short to ground or open on the Park Assist Sensor 1 Signal circuit.

DEFAULT ACTION

- Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 1 DISCONNECTED
PARK ASSIST SENSOR 1 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 1 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 1 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 1 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 1 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 1 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK THE (D702) PARK ASSIST SENSOR SIGNAL 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.

2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X702) PARK ASSIST SENSOR SUPPLY 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D702) PARK ASSIST SENSOR SIGNAL 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D702) PARK ASSIST SENSOR SIGNAL 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

6. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D702) PARK ASSIST SIGNAL 1 CIRCUIT AND THE (X702) FRONT PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B128E-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 1 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 1 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (D702) PARK ASSIST SIGNAL 1 CIRCUIT FOR A SHORT TO THE (X702) FRONT PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D702) PARK ASSIST SENSOR SIGNAL 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CONNECT A FUSED JUMPER BETWEEN THE (D702) PARK ASSIST SENSOR SIGNAL 1 CIRCUIT AND THE (X751) FRONT SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B128E-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B128E-25-PTS-SENSOR-1-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to
Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor to properly clean or repair sensor.
Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Go To [3](#)

No

- Remove, clean and reinstall sensor.
Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Go to
Refer to [3](#).

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [BODY VERIFICATION TEST](#) .

B128E-92-PTS-SENSOR-1-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR HARNESS CONNECTIONS
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B128F-11-PTS SENSOR 2-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Signal 2 circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 2 DISCONNECTED
PARK ASSIST SENSOR 2 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 2 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 2 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 2 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 2 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 2 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D705) PARK ASSIST SENSOR SIGNAL 2 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D705) PARK ASSIST SENSOR SIGNAL 2 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D705) PARK ASSIST SENSOR SIGNAL 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D705) PARK ASSIST SIGNAL 2 CIRCUIT AND THE (X702) FRONT PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The Electronic ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B128F-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B128F-12-PTS-SENSOR-2-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist signal 2 circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Possible Causes

PARK ASSIST SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 2 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D705) PARK ASSIST SIGNAL 2 CIRCUIT FOR A SHORT TO THE (X702) FRONT PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D705) PARK ASSIST SENSOR SIGNAL 2 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CONNECT A FUSED JUMPER BETWEEN THE (D705) PARK ASSIST SENSOR SIGNAL 2 CIRCUIT AND THE (X751) FRONT SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B128F-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B128F-25-PTS-SENSOR-2-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)

Possible Causes
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to

Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

No

- Remove, clean and reinstall sensor.

Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .

- Go to

Refer to [**3**](#).

3. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B128F-92-PTS-SENSOR-2-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.

- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1290-11-PTS SENSOR 3-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM System voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 3 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 3 DISCONNECTED
PARK ASSIST SENSOR 3 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 3 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 3 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 3 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 3 SUPPLY CIRCUIT OPEN

Possible Causes
PARK ASSIST SENSOR 3 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D706) PARK ASSIST SENSOR SIGNAL 3 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D706) PARK ASSIST SENSOR SIGNAL 3 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D706) PARK ASSIST SENSOR SIGNAL 3 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. CONNECT A FUSED JUMPER BETWEEN THE (D706) PARK ASSIST SIGNAL 3 CIRCUIT AND THE (X702) FRONT PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1290-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1290-12-PTS-SENSOR-3-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.

- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 3 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 3 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 3 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 3 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (D706) PARK ASSIST SIGNAL 3 CIRCUIT FOR A SHORT TO THE (X702) FRONT PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. ISOLATE AND CHECK THE (D706) PARK ASSIST SENSOR SIGNAL 3 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CONNECT A FUSED JUMPER BETWEEN THE (D706) PARK ASSIST SENSOR SIGNAL 3 CIRCUIT AND THE (X751) FRONT SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1290-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1290-25-PTS-SENSOR-3-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to
Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.

2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go To **3**

No

- Remove, clean and reinstall sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go to

Refer to **3**.

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B1290-92-PTS-SENSOR-3-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1291-11-PTS SENSOR 4-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 3 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 4 DISCONNECTED
PARK ASSIST SENSOR 4 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 4 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 4 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 4 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 4 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 4 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D707) PARK ASSIST SENSOR SIGNAL 4 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D707) PARK ASSIST SENSOR SIGNAL 4 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D707) PARK ASSIST SENSOR SIGNAL 4 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D707) PARK ASSIST SIGNAL 4 CIRCUIT AND THE (X702) FRONT PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1291-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 4 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 4 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 4 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 4 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (D707) PARK ASSIST SIGNAL 4 CIRCUIT FOR A SHORT TO THE (X702) FRONT PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D707) PARK ASSIST SENSOR SIGNAL 4 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **4**

4. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To **5**

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CONNECT A FUSED JUMPER BETWEEN THE (D707) PARK ASSIST SENSOR SIGNAL 4 CIRCUIT AND THE (X751) FRONT SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1291-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1291-25-PTS-SENSOR-4-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to
Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go To [3](#)

No

- Remove, clean and reinstall sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go to

Refer to [3](#).

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B1291-92-PTS-SENSOR-4-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1292-11-PTS SENSOR 5-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 5 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 5 DISCONNECTED
PARK ASSIST SENSOR 5 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 5 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 5 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 5 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 5 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 5 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D708) PARK ASSIST SENSOR SIGNAL 5 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D705) PARK ASSIST SENSOR SIGNAL 5 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D708) PARK ASSIST SENSOR SIGNAL 5 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D708) PARK ASSIST SIGNAL 5 CIRCUIT AND THE (X702) FRONT PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1292-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B1292-12-PTS-SENSOR-5-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 5 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 5 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Possible Causes

PARK ASSIST SENSOR 5 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 5 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D708) PARK ASSIST SIGNAL 5 CIRCUIT FOR A SHORT TO THE (X702) FRONT PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D708) PARK ASSIST SENSOR SIGNAL 5 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CONNECT A FUSED JUMPER BETWEEN THE (D708) PARK ASSIST SENSOR SIGNAL 5 CIRCUIT AND THE (X751) FRONT SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1292-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1292-25-PTS-SENSOR-5-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)

Possible Causes
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to

Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**.

- Go To [3](#)

No

- Remove, clean and reinstall sensor.

Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .

- Go to

Refer to [**3**](#).

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1292-92-PTS-SENSOR-5-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.

- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1293-11-PTS SENSOR 6-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 6 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 6 DISCONNECTED
PARK ASSIST SENSOR 6 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 6 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 6 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 6 SIGNAL CIRCUIT OPEN

Possible Causes
PARK ASSIST SENSOR 6 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 6 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D709) PARK ASSIST SENSOR SIGNAL 6 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D709) PARK ASSIST SENSOR SIGNAL 6 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D709) PARK ASSIST SENSOR SIGNAL 6 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. ISOLATE AND CHECK THE (X702) FRONT PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

8. CONNECT A FUSED JUMPER BETWEEN THE (D709) PARK ASSIST SIGNAL 6 CIRCUIT AND THE (X702) FRONT PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1293-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1293-12-PTS-SENSOR-6-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.

- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 6 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 6 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 6 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 6 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (D709) PARK ASSIST SIGNAL 6 CIRCUIT FOR A SHORT TO THE (X702) FRONT PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. ISOLATE AND CHECK THE (D709) PARK ASSIST SENSOR SIGNAL 6 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. ISOLATE AND CHECK THE (X751) FRONT PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CONNECT A FUSED JUMPER BETWEEN THE (D709) FRONT PARK ASSIST SENSOR SIGNAL CIRCUIT AND THE (X751) FRONT SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1293-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1293-25-PTS-SENSOR-6-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to
Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.

2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .

- Go To [3](#)

No

- Remove, clean and reinstall sensor.

Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .

- Go to

Refer to [3](#).

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1293-92-PTS-SENSOR-6-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE FRONT SENSORS.
- Front Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1295-11-PTS SENSOR 8-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6- and 16.6 volts.
- PAM System voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 8 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 8 DISCONNECTED
PARK ASSIST SENSOR 8 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 8 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 8 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 8 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 8 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 8 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D701) PARK ASSIST SENSOR SIGNAL 8 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.

2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D701) PARK ASSIST SENSOR SIGNAL 8 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D701) PARK ASSIST SENSOR SIGNAL 8 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D701) PARK ASSIST SIGNAL 8 CIRCUIT AND THE (X700) REAR PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1295-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [**9**](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status for Reverse gear.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 8 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 8 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 8 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 8 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (D701) PARK ASSIST SIGNAL 8 CIRCUIT FOR A SHORT TO THE (X700) REAR PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D701) PARK ASSIST SENSOR 8 SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **4**

4. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To **5**

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CONNECT A FUSED JUMPER BETWEEN THE (D701) PARK ASSIST SENSOR 8 SIGNAL CIRCUIT AND THE (X750) REAR SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1295-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

B1295-25-PTS-SENSOR-8-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go to
Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go To [3](#)

No

- Remove, clean and reinstall sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go to

Refer to [3](#).

3. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1295-92-PTS-SENSOR-8-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1296-11-PTS SENSOR 9-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 9 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 9 DISCONNECTED
PARK ASSIST SENSOR 9 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 9 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 9 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 9 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 9 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 9 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.

6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK THE (D703) PARK ASSIST SENSOR SIGNAL 9 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D703) PARK ASSIST SENSOR SIGNAL 9 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D703) PARK ASSIST SENSOR SIGNAL 9 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D703) PARK ASSIST SIGNAL 9 CIRCUIT AND THE (X700) REAR PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1296-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1296-12-PTS-SENSOR-9-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status for Reverse gear.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 9 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 9 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 9 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 9 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (D703) PARK ASSIST 9 SIGNAL CIRCUIT FOR A SHORT TO THE (X700) REAR PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D703) PARK ASSIST SENSOR 9 SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CONNECT A FUSED JUMPER BETWEEN THE (D703) PARK ASSIST SENSOR SIGNAL 9 CIRCUIT AND THE (X750) REAR SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1296-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1296-25-PTS-SENSOR-9-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)

Possible Causes
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To

Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**.

- Go To [3](#)

No

- Remove, clean and reinstall sensor.

Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .

- Go to

Refer to [**3**](#).

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1296-92-PTS-SENSOR-9-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.

- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM Module DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1297-11-PTS SENSOR 10-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 10 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 10 DISCONNECTED
PARK ASSIST SENSOR 10 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 10 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 10 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 10 SIGNAL CIRCUIT OPEN

Possible Causes
PARK ASSIST SENSOR 10 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 10 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE (D704) PARK ASSIST SENSOR 10 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **3**

3. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **4**

4. ISOLATE AND CHECK THE (D704) PARK ASSIST SENSOR SIGNAL 10 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D704) PARK ASSIST SENSOR SIGNAL 10 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D704) PARK ASSIST SIGNAL CIRCUIT 10 AND THE (X700) REAR PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1297-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1297-12-PTS-SENSOR-10-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status for Reverse gear.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 10 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 10 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 10 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 10 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

2. ISOLATE AND CHECK THE (D704) PARK ASSIST SIGNAL 10 CIRCUIT FOR A SHORT TO THE (X700) REAR PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D704) PARK ASSIST SENSOR SIGNAL 10 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CONNECT A FUSED JUMPER BETWEEN THE (D704) PARK ASSIST SENSOR SIGNAL 10 CIRCUIT AND THE (X750) REAR SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1297-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1297-25-PTS-SENSOR-10-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.

- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To

Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go To **3**

No

- Remove, clean and reinstall sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go to

Refer to **3**.

3. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B1297-92-PTS-SENSOR-10-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.

5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- Test complete.

B1298-11-PTS SENSOR 11-CIRCUIT SHORT TO GROUND

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM System voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run Position.
- PAM monitoring PRNDL status R/D.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- PAM detects an open or short to ground on the Park Assist Sensor 11 Signal circuit.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 11 DISCONNECTED
PARK ASSIST SENSOR 11 SIGNAL SHORTED TO GROUND
PARK ASSIST SENSOR 11 SUPPLY SHORTED TO GROUND
PARK ASSIST SENSOR 11 SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
PARK ASSIST SENSOR 11 SIGNAL CIRCUIT OPEN
PARK ASSIST SENSOR 11 SUPPLY CIRCUIT OPEN
PARK ASSIST SENSOR 11 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: A damaged or disconnected sensor will set this DTC.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (D710) PARK ASSIST SENSOR SIGNAL 11 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D710) PARK ASSIST SENSOR SIGNAL 11 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D710) PARK ASSIST SENSOR SIGNAL 11 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

6. ISOLATE AND CHECK THE (X700) REAR PARK ASSIST SENSOR SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE (D710) PARK ASSIST SIGNAL CIRCUIT 11 AND THE (X700) REAR PARK ASSIST SUPPLY CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT HIGH DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the 5-Volt Supply circuit at the sensor harness connector.
4. Lift Vehicle to a height where the wheels do not touch the ground.
5. Turn the ignition on without starting the engine.
6. Place the Transmission in reverse.
7. With the scan tool, read DTCs.

Does the scan tool display the DTC B1298-12 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [**MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .
- Test complete.

B1298-12-PTS-SENSOR-11-CIRCUIT SHORT TO BATTERY

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor (if equipped with front park assist) is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- PAM monitoring PRNDL status for Reverse gear.
- System is not turned off by Park Assist disable switch.

SET CONDITION

- The PAM detects a short to voltage on the Park Assist Sensor 11 Signal circuit during self-test.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVICE PARK ASSIST SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR 11 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PARK ASSIST SENSOR 11 SIGNAL CIRCUIT SHORTED TO THE PARK ASSIST SENSOR SUPPLY CIRCUIT
PARK ASSIST SENSOR 11 GROUND CIRCUIT OPEN
PARK ASSIST SENSOR
PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN
 1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
 2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE (D710) PARK ASSIST SIGNAL 11 CIRCUIT FOR A SHORT TO THE (X700) REAR PARK ASSIST SENSOR SUPPLY

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D710) PARK ASSIST SENSOR SIGNAL 10 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PAM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (X750) REAR PARK ASSIST GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CONNECT A FUSED JUMPER BETWEEN THE (D710) PARK ASSIST SENSOR SIGNAL 10 CIRCUIT AND THE (X750) REAR SENSOR GROUND CIRCUIT AT THE PARK ASSIST SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PAM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the DTC B1298-11 with the jumper in place?

Yes

- Replace the Park Assist Sensor in accordance with the Service information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B1298-25-PTS-SENSOR-11-SIGNAL SHAPE / WAVEFORM FAILURE

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM Module detects an internal Sensor error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE WIPE REAR SENSORS.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST SENSOR MEMBRANE OBSTRUCTION (ICE, SNOW, FROST, MUD, DIRT COVERING FASCIA)
PARK ASSIST SENSOR CONNECTOR OBSTRUCTION (ICE, SNOW, MUD, DIRT)
DECOUPLING RING MISSING/MOUNTED WRONG
OBJECTS - SUCH AS LICENSE PLATES - IN CLOSE RANGE TO THE SENSOR
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.

7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To
Refer to [2](#).

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. INSPECT SENSOR

1. Inspect exterior of bumper for snow, ice or dirt covering sensor.
2. Inspect sensor connections for snow, ice or dirt.
3. Inspect for a missing or improperly mounted decoupling ring.
4. Inspect for correct installation.

Were any of the conditions found?

Yes

- Clear area around sensor of any obstructions or objects.
- Clean Sensor.
- Remove sensor if necessary to properly clean or repair sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go To [3](#)

No

- Remove, clean and reinstall sensor.

Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .

- Go to

Refer to [3](#).

3. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Park Assist Sensor in accordance with the Service Information. Refer to [**SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1298-92-PTS-SENSOR-11-PERFORMANCE OR INCORRECT OPERATION

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: **The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- PAM supply voltage is between 9.6 and 16.6 volts.
- PAM system voltage is between 10.0 and 16.0 volts.
- With the ignition in the run position.
- The PAM is monitoring PRNDL status R/D.
- System is not turned off by Park Assist switch.
- During the self-test while the vehicle is in drive between 11 km/h (7 mph) and 40 km/h (25 mph).

SET CONDITION

- The PAM detects data corruption in the transmission in the internal communication line between the module and sensors, this code will set.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARKING ASSISTANCE SERVICE REAR SENSORS.
- Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
POOR WIRING CONNECTIONS
PARK ASSIST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Verify the Park Assist Sensor is not damaged and properly connected before proceeding with this diagnostic procedure.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

NOTE: **A damaged or disconnected sensor will set this DTC.**

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. REPLACE THE PARK ASSIST SENSOR AND RETEST FOR DTCS

1. Replace Park Assist Sensor in accordance with the Service Information. Refer to **SENSOR, PARK ASSIST, REMOVAL AND INSTALLATION** .
2. Connect the component and ECU harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replacing the faulty component repaired the fault.

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B12B2-2A-PARALLEL-PERPENDICULAR PARK ASSIST SWITCH-STUCK

THEORY OF OPERATION

The Park Assist Sensors are ultrasonic transceivers that are controlled by the Park Assist Module (PAM). The sensors transmit and receive ultrasonic signals. Each sensor has a voltage, signal, and return circuit to the module. The sensors communicate with the PAM using a dedicated serial bus communication circuit.

NOTE: The numbering system for the park assist sensors allows for up to twelve sensors on the vehicle, six front and six rear. The sensors are numbered in a clockwise manner starting at the left front bumper. The left front sensor is the number 1 sensor. The numbering continues in a clockwise direction around the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Battery voltage is between 9.6 and 16.6 volts.
- System voltage is between 10.0 and 16.0 volts.
- With the ignition in the Run position and crank delay timer expired.
- U0002-00 DTC not active.

SET CONDITION

- The Park Assist Module (PAM) has received a bussed message from the Integrated Center Stack (ICS) that the Parallel/Perpendicular Park Assist (PPPA) button is pressed longer than 60 seconds.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PPPA DISABLED.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
DEBRIS IN PARALLEL/PERPENDICULAR PARK ASSIST (PPPA) SWITCH
INTEGRATED CENTER STACK (ICS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR DEBRIS IN ICS

1. Check for debris in ICS.

Was debris found?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. REMOVE DEBRIS AND RETEST FOR DTCS

1. Turn the ignition off.
2. Remove debris and clean ICS.
3. Turn the ignition on.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace ICS POD Switch Bank in accordance with the Service Information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B210C-16-BATTERY VOLTAGE INPUT - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete PARK ASSIST SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position and crank delay timer expired.
- StopStart warm crank is not in progress.

SET CONDITION

- The PAM detects that the supply voltage is less than 10.0 volts for 15 seconds.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM FUSED IGNITION RUN/START CIRCUIT OPEN OR EXCESSIVE RESISTANCE GROUND CIRCUIT EXCESSIVE RESISTANCE PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCS before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCS present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE (F916) FUSED IGNITION RUN/START CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the **BODY VERIFICATION TEST**. Refer to [**BODY VERIFICATION TEST**](#) .

4. CHECK THE (Z916) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.

2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

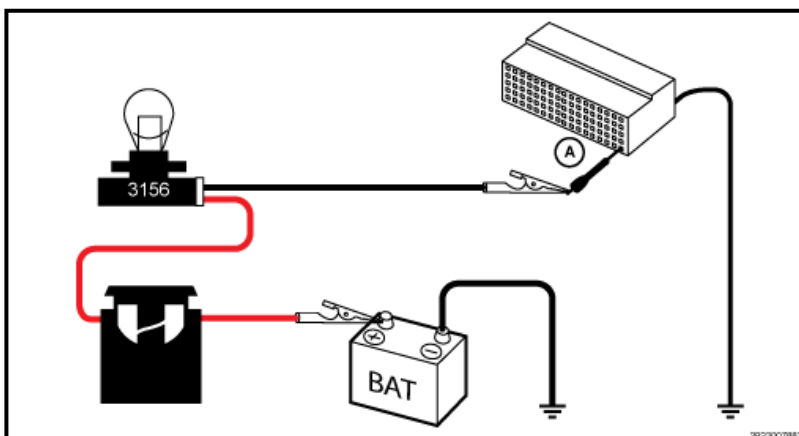
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B210C-17-BATTERY VOLTAGE INPUT - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position and crank delay timer expired.

SET CONDITION

- The PAM has detected that the module supply voltage is greater than 16.0 volts for 15 seconds.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM RELATED DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Verify the Battery is in good condition. and perform the Battery System diagnostic procedure. Refer to **DIAGNOSIS AND TESTING** , or **DIAGNOSIS AND TESTING** .
2. With the scan tool in ECU View, select PCM and check for any Charging System related DTCS.

Does the scan tool display any Charging System related DTCS?

Yes

- Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** and perform the appropriate charging system or battery DTC diagnostic procedure.

No

- Replace the PAM in accordance with the Service information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B21DD-16-SYSTEM VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position and crank delay timer expired.
- StopStart warm crank is not in progress.

SET CONDITION

- The PAM has received a bussed message system voltage below threshold.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#), or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PAM DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B21DD-17-SYSTEM VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete PARK ASSIST SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position and crank delay timer expired.

SET CONDITION

- The PAM received a bussed message system voltage is above threshold.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM PARK ASSIST MODULE (PAM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCS before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCS present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#), or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PAM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PAM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase PAM DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

B222A-00-VEHICLE LINE MISMATCH

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Battery voltage between 9.6-16.6 volts.
- Last plausible system voltage of 10.0-16.0 volts.
- With the ignition in the Run position and crank delay timer expired.
- U0002-00 DTC not active.

SET CONDITION

- If the Vehicle Line data transmitted on the bus doesn't correspond with the data stored in the Park Assist (PAM) Module.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display PARK ASSIST SYSTEM DISABLED.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
INCORRECT CONFIGURATION ANOTHER CAN C MODULE

Possible Causes
PARK ASSIST MODULE (PAM)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE VEHICLE CONFIGURATION

NOTE: If CAN C bus communication DTCs are present, perform the **COMMUNICATION DIAGNOSTIC PROCEDURE**. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

1. With the scan tool, check the vehicle configuration stored in the Body Control Module (BCM).

Pick the answer that best describes your findings:

BCM has the wrong/no vehicle configuration.

- Go To [3](#)

BCM has the correct vehicle configuration and the DTC is active in the PAM.

- Check if other modules such as the Powertrain Control Module (PCM) and Instrument Panel Cluster (IPC) have the wrong configuration stored in the controller and reprogram or replace as necessary.
- If all other modules show the proper configuration, replace and program the PAM Module in accordance with the Service Information. Refer to **MODULE, PARK ASSIST (PAM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE BCM HARDWARE, SOFTWARE, AND PART NUMBERS

NOTE: If CAN C bus communication DTCs are present, perform the **COMMUNICATION DIAGNOSTIC PROCEDURE**. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE**.

1. With the scan tool, look at the BCM hardware, software, and part numbers and record on the repair order.

Are the BCM hardware, software, and part numbers correct for the vehicle?

Yes

- With the scan tool, program the proper vehicle configuration into the BCM.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Replace the BCM in accordance with the service information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

B2232-00-(PTS) PARKTRONICS INTERNAL

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position.
- Battery voltage between 9.6-16.6 volts.

SET CONDITION

- The Park Assist (PAM) Module has detected a RAM/ROM failure on start-up.
- The PAM has detected an EEPROM error.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display SERVIC PARK ASSIST.
- Front and Rear Park Assist is disabled.
- Parallel/Perpendicular Park Assist is disabled.

POSSIBLE CAUSES

Possible Causes
PARK ASSIST MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the PAM in accordance with the Service Information. Refer to [MODULE, PARK ASSIST \(PAM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: Perform this diagnostic procedure **ONLY** when the DTC status is "Active". If the DTC status is "Stored" **DO NOT** proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0102-00-LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0131-00-LOST COMMUNICATION WITH POWER STEERING CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0137-00-LOST COMMUNICATION WITH TRAILER BRAKE CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0155-00-LOST COMMUNICATION WITH CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0229-00-LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0401-00-IMPLAUSIBLE DATA RECEIVED FROM ECM-PCM A-OR IMPLAUSIBLE ENGINE SPEED SIGNAL RECIEVED

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0402-00-IMPLAUSIBLE DATA RECEIVED FROM TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0403-00-IMPLAUSIBLE DATA RECEIVED FROM T-CASE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0415-00-IMPLAUSIBLE DATA RECEIVED FROM ABS

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0420-00-INVALID DATA RECEIVED FROM POWER STEERING CONTROL MODULE "A"

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0423-00-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0429-00-IMPLAUSIBLE DATA RECEIVED FROM STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0438-00-IMPLAUSIBLE DATA RECEIVED FROM TRAILER CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

2021 ACCESSORIES AND BODY, CAB

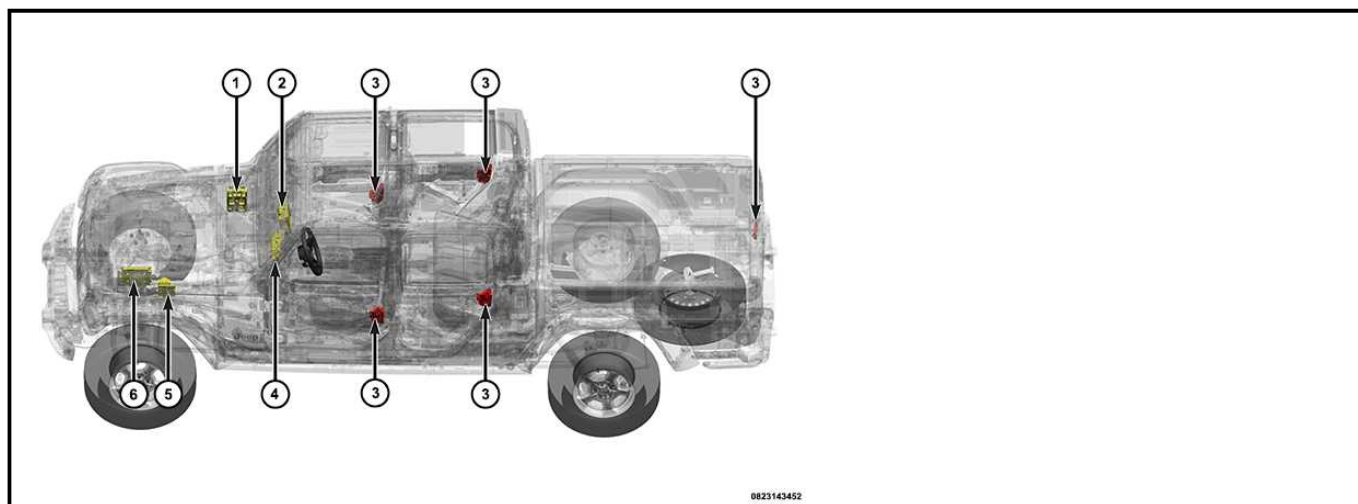
Power Locks (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION - STANDARD LOCK

DESCRIPTION - STANDARD LOCK



A power operated door and tailgate lock system is standard factory-installed equipment on this vehicle. The power lock system allows all of the doors and the tailgate to be locked or unlocked electrically. Locking or unlocking the vehicle using the power lock system can be accomplished by three different methods:

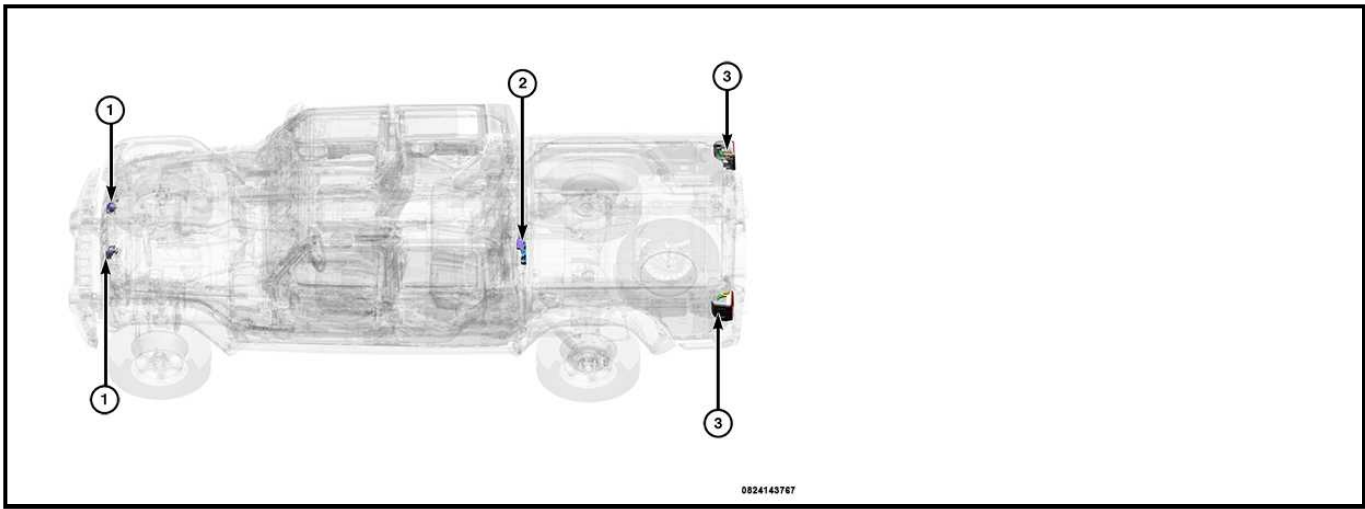
Power Lock System - Operating a power lock system switch on either front door inside trim panel will lock or unlock the latches of the doors and the tailgate. The following components comprise the power lock system:

COMPONENT INDEX

1	Refer to BODY CONTROL MODULE (BCM) .
2	Refer to UCONNECTB® RADIO SCREEN .
3	Refer to POWER LOCK MOTOR - Integrated into the door latches and the tailgate latch.
4	Refer to INSTRUMENT PANEL CLUSTER (IPC) .
5	Refer to ANTI-LOCK BRAKING SYSTEM (ABS) MODULE .
6	Refer to POWERTRAIN CONTROL MODULE (PCM) .
-	Refer to POWER LOCK SWITCH .
-	Refer to AJAR SWITCH - Integrated into the door latches and the tailgate latch.
-	Refer to TRANSMISSION CONTROL MODULE (TCM) - Automatic Transmission TCM is integral to the transmission.
-	Refer to LOCK CYLINDER - Doors, Fuel Door, Glove Compartment, Tailgate.

DESCRIPTION - REMOTE KEYLESS ENTRY (RKE)

DESCRIPTION - REMOTE KEYLESS ENTRY (RKE)



In addition to the power lock components, the Remote Keyless Entry (RKE) system also includes the following components:

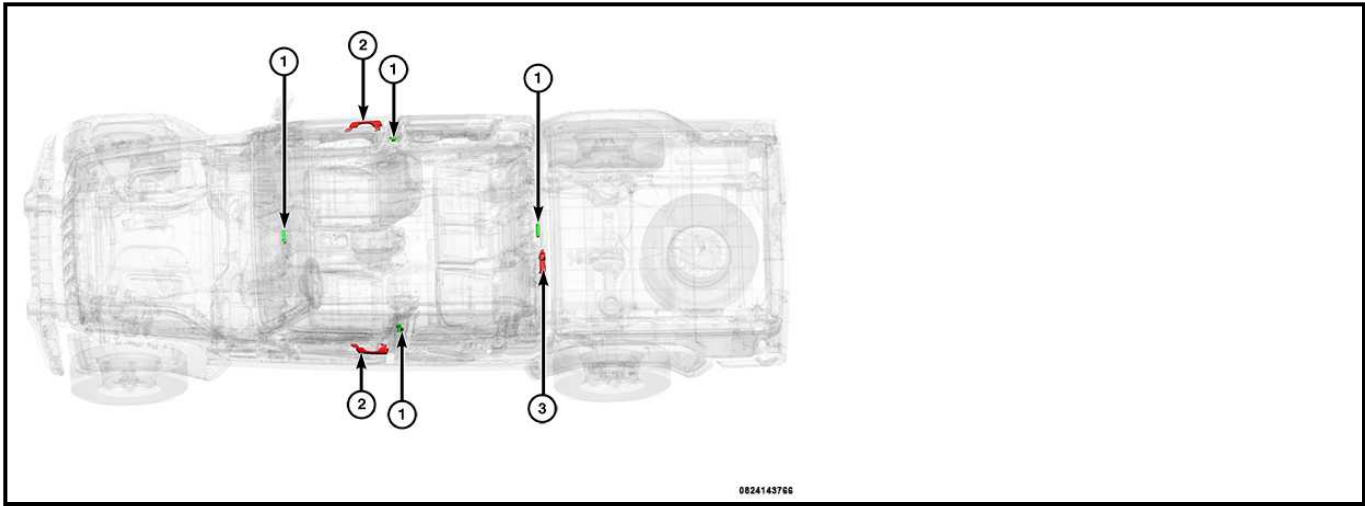
COMPONENT INDEX

1	Refer to <u>HORNS</u> .
2	Refer to <u>RADIO FREQUENCY HUB (RFH)</u> .
3	Refer to <u>TURN SIGNAL LAMPS</u> .
-	Refer to <u>KEY FOB</u> .

Pressing the **Lock** or **Unlock** button of the RKE transmitter can also be used to lock or unlock the latches of the doors and the tailgate. The specific locks operated and the number of key fob presses required varies depending upon the customer programmable settings chosen by the vehicle operator.

DESCRIPTION - PASSIVE ENTRY (PE) SYSTEM

DESCRIPTION - PASSIVE ENTRY (PE) SYSTEM



In addition to the components listed in the power lock and RKE overviews, the PE system also includes:

COMPONENT INDEX

1	Refer to <u>LOW FREQUENCY (LF) ANTENNA</u> - four total located throughout this vehicle.
2	Refer to <u>SMART DOOR HANDLE</u> - Tactile Handle Switches.
3	Refer to <u>RADIO FREQUENCY HUB (RFH)</u> .

The PE system allows the vehicle to be unlocked without the use of a key or a press of a key fob button. The front door handles are equipped with a tactile door locking request button and a capacitive touch sensor

arranged inside the handle. When contacting these buttons, a valid key fob signal is identified in that same zone and is used to lock or unlock the doors. This feature allows the customer to passively unlock the doors.

OPERATION

Power Locks

The power lock system uses non-switched battery current received through a fused B(+) fuse in the BCM so that the system remains operational regardless of the status of the ignition switch. The BCM is the primary power lock system controller.

When the BCM receives a lock/unlock input, it responds to these request messages by providing the appropriate outputs to each of the power lock motors to lock or unlock each of the door latches. The BCM also monitors electronic message inputs indicating automatic transmission gear selector position and vehicle speed for tailgate power lock operation.

The BCM also stores the power lock system Customer Programmable feature settings received over the Controller Area Network (CAN) data bus from the radio screen. The BCM uses these settings and internal programming along with hard wired and electronic message inputs to determine the proper outputs needed to produce each of the appropriate power lock system features.

The power lock system circuits are continually monitored and controlled by the microprocessor and software contained within the BCM. When the BCM monitors a problem in any of the power lock system circuits or components, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit.

Remote Keyless Entry

The RKE system uses non-switched battery current received through a fused B(+) fuse so that the system remains operational regardless of the ignition switch position. The RFH is the primary RKE system controller along with the BCM. The RFH validates each RKE transmission and sends a CAN request to the BCM to unlock/lock the vehicle. It ignores requests from any transmitter for which it has no stored vehicle access code. When the BCM receives a valid request from the RFH, it uses internal programming to provide the appropriate hard wired outputs to invoke the proper RKE system features and responses.

The RKE system circuits and transmitter inputs are continually monitored by the RFH. When the RFH monitors a problem in any of the RKE system circuits or transmitters, it stores a DTC in its memory circuit.

Passive Entry

In the Passive Entry Keyless Go (PEKG) system the doors are unlocked passively; however, they must still be locked actively after exiting the vehicle using the tactile **Lock** button on either front door smart handle or the tailgate handle switch. When the system senses a hand approaching the capacitive switch in the handle or detects a button press of the tailgate switch, it sends out challenge messages through the LF antennas to authenticate the presence and location of a valid key fob.

The key fob responds by sending a Ultra High Frequency (UHF) message back to the receiver within the RFH. If the RFH determines the key fob is valid and that it is located outside the vehicle in the same zone or vicinity as the door handle or tailgate handle switch being activated, it sends an electronic **Unlock Request** message over the CAN data bus to the BCM to automatically unlock and allow entry.

The PEKG system circuits and key fob inputs are continually monitored by the software contained within the RFH. When the RFH monitors a problem in any of the PEKG system circuits or key fob inputs, it stores a DTC in its memory circuit.

Some features of the Power Lock system:

Automatic Door Locking:

Automatic door locking automatically locks any unlocked door when the vehicle speed exceeds about 20 Kilometers Per Hour (KPH) or 13 Miles Per Hour (MPH). This is a Customer Programmable feature. Note that only the doors are considered and not the tailgate or hood.

Automatic Door Unlocking:

Automatic door unlocking automatically unlocks the doors after they were automatically locked when the vehicle speed exceeded about 20 kph (13 mph), the vehicle speed has returned to zero, the transmission shift lever is in the **Neutral** or **Park** positions and the driver side front door is opened. This is a Customer Programmable feature. Note that only the doors are considered and not the tailgate or hood.

Customer Programmable Features:

The vehicle operator interfaces with the BCM, which is the power lock system controller, using a specific Uconnect™ touch screen options menu. The options menu allows the vehicle operator to set or change the power lock system Customer Programmable Features.

Enhanced Accident Response System:

In the event of a vehicle impact that causes airbag deployment but leaves vehicle electrical power intact, the Enhanced Accident Response System (EARS) automatically turns off the supply of fuel to the engine, turns on the interior courtesy lamps, turns on the hazard warning flashers and unlocks the doors after the vehicle speed has returned to zero. This helps emergency responders in their efforts to render the appropriate assistance. The courtesy lamps and hazard flashers remain on as long as the battery has power or until the key is removed from the ignition.

Illuminated Entry:

Automatic illumination of the interior courtesy lamps when the vehicle is unlocked using the power lock system.

AJAR SWITCH

AJAR SWITCH

Refer to [COMPONENT INDEX](#).

The ajar switch is integrated into their respective latches and hard wired to the BCM. The BCM is responsible for reading the ajar signals at the various Vehicle Access Points (VAP) and broadcasting their status over the vehicle CAN bus. Those signals are:

- Hood Open/Closed
- Left Front Door Open/Closed
- Left Rear Door Open/Closed
- Right Front Door Open/Closed
- Right Rear Door Open/Closed
- Tailgate Open/Closed
- Hard Top On/Off

In order to perform a lock or unlock command, the BCM has to detect if a door, tailgate or hood is open or closed by signal sent to the BCM by the ajar switch. When the ajar switch is open, this indicates that the VAP is physically closed. When the ajar switch reads closed, this means that the VAP is physically open.

The BCM also provides a reference voltage on the hood ajar switch sense circuit. The Hood Ajar Switch switches the hood ajar switch sense circuit to ground when the hood is open. A diagnostic resistor internal to the switch is placed in parallel with the switch.

Since the vehicle can be driven with the doors removed from the vehicle the BCM looks at the voltage of the door ajar switches, There are 2 resistors incorporated into each ajar switch and the return voltages are approximately:

- Door Closed (Switch Open) 8 volts
- Door Open (Switch Closed) 4 volts
- Door Removed 12 volts

ANTI-LOCK BRAKING SYSTEM (ABS) MODULE

ANTI-LOCK BRAKING SYSTEM (ABS) MODULE

Refer to [COMPONENT INDEX](#).

Outputs

- Vehicle Speed Signal (VSS) to the BCM during auto lock and auto unlock requests.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM is the central gateway module for the CAN bus. This means the BCM is able to interpret any bus message on any vehicle network, convert and then re purpose that signal to another vehicle network thus allowing vehicle communications and operations between the different bus networks and vehicle systems.

The BCM on Left Hand Drive (LHD) vehicles is located behind the right side kick panel. For Right Hand Drive (RHD) vehicles, the BCM will be located behind the left side kick panel.

The BCM monitors the driver and passenger Lock/Unlock switches, through the door lock switch status and the door lock switch return circuits. When the BCM receives a door lock or unlock signal from the driver or passenger door lock/unlock switch, the BCM provides a signal to the door lock/unlock motors, through the door lock control and door unlock control circuits. The door lock/unlock motors are integral to the driver and passenger door latches. The locking command is only carried out if the doors are properly shut and the locks unlocked. Conversely, the unlocking command is only carried out if the locks are locked.

The BCM also stores the power lock system customer programmable feature settings received from the radio menu options. The BCM uses these settings and internal programming along with hard wired and electronic message inputs to determine the proper outputs needed to produce each of the appropriate power lock system features.

The power lock system circuits are continually monitored and controlled by the BCM. When the BCM monitors a problem in any of the power lock system circuits or components, it stores a fault code or DTC in its memory circuit.

RKE Specific:

In the event that the vehicle is not equipped with PEKG, the RFH receives data signals from the RKE transmitter. These data signals can include the number of button presses and which button was pressed to determine the requested event. The RFH sends the request to the BCM which then reads this data to provide the appropriate hard wired outputs to invoke the proper RKE system features and responses. The BCM then interprets a rolling code from the RKE transmitter to validate that the transmitter is synced to the vehicle.

If these data signals indicate that the doors are to be remotely locked, the BCM sends the output for a single horn activation and turn signal lamps illumination when vehicle locking is complete.

The BCM receives deadlocking requests and commands all of the doors locked and sets the deadlock activation. The BCM will deactivate the deadlocking on request. Deactivation is always managed in parallel for

all doors.

Also, on vehicle remote start requests, the BCM performs a central locking command upon successful engine starting.

Inputs

- The BCM receives an input from the ajar switches to wake the module as well as the state of the VAP
- Vehicle speed and Accelerator position from the PCM for auto lock and unlock feature
- Door lock cylinder switch inputs to the BCM when a key is inserted
- RKE input requests for lock and unlock
- Customer programmable features from the radio

Outputs

- Manages and controls the outputs to the power lock system and relays
- Turn signal lamp activation
- Horn activation
- Output to the IPC for illumination and indication messages

HORNS

HORNS

Refer to [COMPONENT INDEX](#).

If the vehicle is equipped with an alarm system or if a lock request is sent using the RKE transmitter, the BCM sends a request to the horn for a horn chirp.

KEY FOB

KEY FOB

Refer to [COMPONENT INDEX](#).

The RKE system transmitter is the battery powered, wireless and portable Radio Frequency (RF) user controller for all of the features of the RKE system.

The RKE transmitter, when a button is pressed, sends a signal to the RFH indicating what button was pressed, how many times and for how long. The RFH interprets these details and, after authentication, requests the BCM to perform the proper requested function.

Flip Key (Integral to the Key Fob)

The flip key is used only for mechanical locking and unlocking of the lock cylinders.

This key is side-milled cut and can be serviced with the use of the cutting machines which are now available in the MOPAR Equipment Catalog. If your Service Department does not source a cutting machine capable of this process, replacement keys may be ordered via the Vehicle Identification Number (VIN) order entry process located in the "PARTS" tab of DealerConnect.

This key does not require any additional special programming. The standard process of marrying the key to the vehicle using Diagnostic Routines located in the diagnostic scan tool is still required.

To program the key fob, please Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#) .

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [**COMPONENT INDEX**](#).

The BCM is connected via the CAN-Interior High Speed (IHS) data bus network to the IPC. The BCM uses this bus network to communicate requests to the IPC for Light Emitting Diode (LED) illumination and "door open" warning light and messages.

LOCK CYLINDER

LOCK CYLINDER

Refer to [**COMPONENT INDEX**](#).

The door lock cylinder is a mechanical device allowing the customer to unlock or lock the vehicle with a bladed key. The key fob on this vehicle has a mechanical flip key solely for the purpose of locking or unlocking the lock cylinders.

Centralized locking or unlocking using a bladed key is available. The movement of the key cylinder on the driver door handle is detected by a switch connected electrically to the BCM. If the vehicle is being manually locked or unlocked using a bladed key inserted into the key cylinder, the BCM acquires the variation of resistance level and actuates the lock/unlock motor accordingly.

LOW FREQUENCY (LF) ANTENNA

LOW FREQUENCY (LF) ANTENNA

Refer to [**COMPONENT INDEX**](#).

There are four Low Frequency (LF) antennas located on this vehicle:

- Behind the Integrated Center Stack (ICS)
- Behind the right B-Pillar
- Behind the left B-Pillar
- Behind the rear trim panel secured to the cab

The LF antennas allow the transmitter within the RFH to communicate with a key fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle.

The RFH uses communication through the LF antennas to wake up and challenge a key fob that is within range in order to authenticate whether that key fob is valid (programmed) to the vehicle.

The RFH communication with the key fob is on a 125 kilohertz using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RFH. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RFH continuously monitors all of the LF antenna units and will store a DTC for any fault that it detects.

POWER LOCK MOTOR

POWER LOCK MOTOR

Refer to [**COMPONENT INDEX**](#).

All the door locking motors are protected and managed by the BCM.

Inside the actuators are Positive Temperature Coefficient (PTC) elements that are in series with their motors. The PTC elements permit thermal protection in the event that the BCM continues to supply current to the motors due to a fault. The resistance of the PTC element increases as its temperature increases, consequently interrupting the electrical circuit.

The locking motors are integrated to each of the door latch assemblies with the exception of the tailgate. The tailgate lock actuator is attached to the rear tailgate and handle assembly and is serviced separately.

POWER LOCK SWITCH

POWER LOCK SWITCH

Refer to [COMPONENT INDEX](#).

The power lock system uses non-switched battery current received through a fused B (+) fuse so that the system remains operational regardless of the ignition switch position.

Both the driver and passenger door lock and unlock switch are able to centrally lock and unlock all door latches.

Both the driver and passenger door lock unlock switches are disabled if the doors are locked from outside of the vehicle. The switches will be enabled again after an unlock operation is performed from outside of the vehicle or when an authenticated key fob is recognized at ignition **on** .

POWERTRAIN CONTROL MODULE (PCM)

POWERTRAIN CONTROL MODULE (PCM)

Refer to [COMPONENT INDEX](#).

Outputs

- The PCM is responsible for bussing the clutch switch status signal and the Accelerator Pedal Position Sensor (APPS) value to the BCM during auto lock and auto unlock requests.

RADIO FREQUENCY HUB (RFH)

RADIO FREQUENCY HUB (RFH)

Refer to [COMPONENT INDEX](#).

The RFH, along with the BCM, is the primary RKE system controller. It is connected to a fused B(+) circuit and has a path to a clean ground at all times. These connections allow it to remain functional regardless of the ignition switch status. Any input to the RFH that controls a vehicle system function that does not require that the ignition switch status be ON such as depressing a button on an RKE or key fob transmitter, prompts the RFH to wake up and transmit on the CAN data bus.

The RFH marries itself to the BCM and PCM with an Immobilizer Access Code using a high security encryption system called Advanced Encryption Standard (AES) at first key on in the assembly plant.

The RFH is hardwired to the vehicle's smart door handles and multiple LF antennas for purposes of providing PEKG functionality. If the Smart door handles or exterior release switches are activated, the RFH signals the five LF antennas. The LF antenna wakes up the key fob then sends the challenge to confirm if it is the correct key, the key fob will respond with the RF with the challenge response. When a valid key fob is recognized by the RFH a CAN-Chassis (CAN-C) data bus message is sent to BCM to lock or unlock the vehicle by the RFH.

Inputs

- RKE requests
- RKE challenge message responses
- BCM AES authentication
- PCM AES authentication
- Smart Door Handle inputs
- LF antenna inputs

Outputs

- LF antennas for key fob challenges
- Wake key fob output
- BCM and PCM authentication challenges
- BCM for lock or unlock requests
- Requests to the BCM and IPC complaint to the customer programmable features.
- Power and ground to the door handle integrated circuit

UCONNECTB® RADIO SCREEN

UCONNECTB® RADIO SCREEN

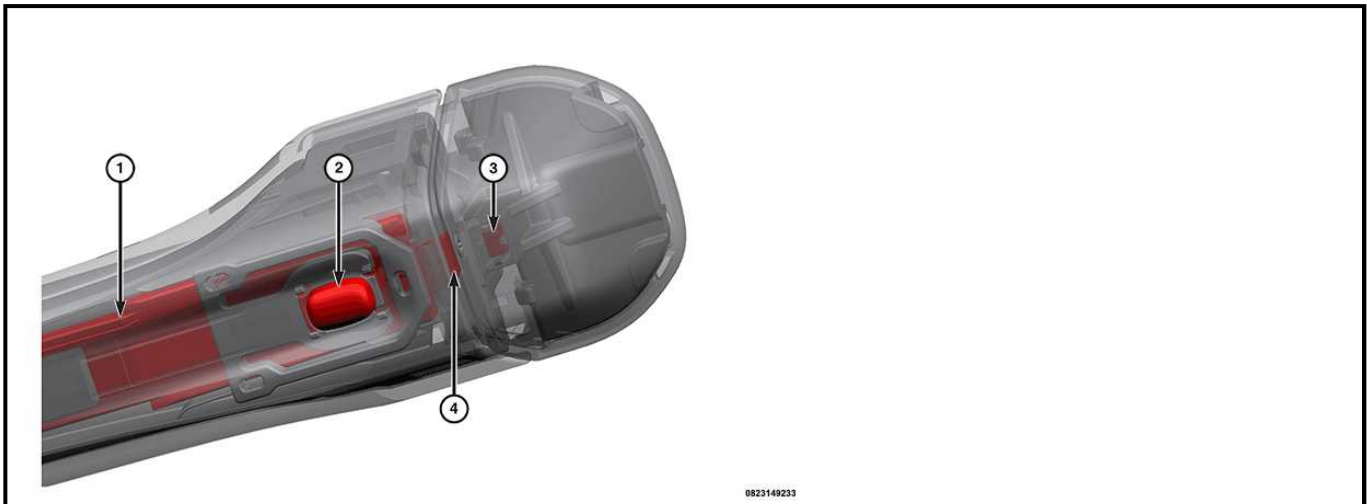
Refer to [COMPONENT INDEX](#).

The radio screen allows the customer to gain access to the Customer Programmable options menu. The customer will be able to select various lock or unlock options. The radio screen will message the strategy requested by the customer to the BCM and RFH.

SMART DOOR HANDLE

SMART DOOR HANDLE

Refer to [COMPONENT INDEX](#).



Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFH up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFH determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected key fob.

The three switches of each PE outside smart door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFH on a signal circuit, and a clean ground from the RFH on a return circuit. The PE handle IC and the RFH communicate with each other by modulating the current in the signal circuit.

The tactile, mechanical, resistive membrane lock switch (2) allows the user to actively lock the vehicle. The capacitive switch (1) senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch (4) senses handle pull movement using a magnet (3) internal to the cap. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

This vehicle uses three smart handles, one for each front door and one for the tailgate. The RFH detects the vicinity of the key to the vehicle through the vehicles various LF antennas. The key recognition and authentication stage begins when the vehicle user brings their hand towards the inside of the handle. At that moment, the RFH reads the Key Identification (KEY-ID) and the secret code stored in it. If the RFH identifies it as the key encoded in its memory, it sends the request to unlock the doors or the driver door only (depending on the setting in the customer programmable options menu) to the BCM.

The smart door handle provides the status for the unlock sensor, the lock sensor, the handle pull status and an error status to the RFH.

TRANSMISSION CONTROL MODULE (TCM)

TRANSMISSION CONTROL MODULE (TCM)

Refer to [COMPONENT INDEX](#).

Outputs

- If the vehicle is equipped with an automatic transmission, the TCM outputs the transmission gear state over the CAN bus to the BCM during rolling lock events.

TURN SIGNAL LAMPS

TURN SIGNAL LAMPS

Refer to [COMPONENT INDEX](#).

On certain equipped vehicles, the turn signal lamps are activated briefly for locking indication by the BCM. The BCM controls the turn signal lamp driver and logic.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - POWER LOCKS AND REMOTE KEYLESS ENTRY SYSTEM

POWER LOCK SYSTEM

Following are tests that may help to diagnose the hardwired components and circuits of the power lock system. However, these tests may not prove conclusive in the diagnosis of this system. The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a diagnostic scan tool and the appropriate diagnostic information. The diagnostic scan tool can provide confirmation that the power lock motors are receiving the proper hardwired outputs from the Body Control Module (BCM) for them to perform their power lock system functions.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the power lock system, note the system operation while you actuate both the Lock and Unlock functions with the power lock switches and with the Remote Keyless Entry (RKE) transmitter (also known as the FOB with Integrated Key/FOBIK). Then, proceed as follows:

1. If the entire power lock system fails to function with either the power lock switches or the FOBIK, check the fused B(+) fuse for the power lock system.



2. Confirm that the **Settings > Doors & Locks** found in the radio show the **"Flash lights with Lock"** as Checked (picture below). Once this is confirmed, attempt to lock/unlock with the RKE transmitter and look for the turn signals to flash. If the turn signals flash with a button press from the RKE transmitter, then proceed to diagnosis of the door lock switch.
3. If the power lock system functions with both power lock switches, but not with the FOB/IK, proceed to diagnosis of the RKE system.
4. If the power lock system functions with the FOB/IK, but not with one or both power lock switches, proceed to diagnosis of the door lock switches.
5. If only one power lock motor fails to operate with both power lock switches and the RKE transmitter, proceed to diagnosis of the power lock motor.

RKE SYSTEM

Following are tests that may help to diagnose the RKE system. However, these tests may not prove conclusive in the diagnosis of this system. The most reliable, efficient, and accurate means to diagnose the RKE system requires the use of a diagnostic scan tool and the appropriate diagnostic information. The diagnostic scan tool can provide confirmation that the Radio Frequency Hub (RF-Hub) is being sent the proper RF signals by the RKE transmitters to perform its RKE system functions.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the RKE system, first confirm that the power lock system operates satisfactorily. If the power lock system fails to operate correctly, repair that problem before attempting to diagnose the RKE system. Next, note the RKE system operation while you perform both the Lock and Unlock functions with the RKE transmitter. Then, proceed as follows:

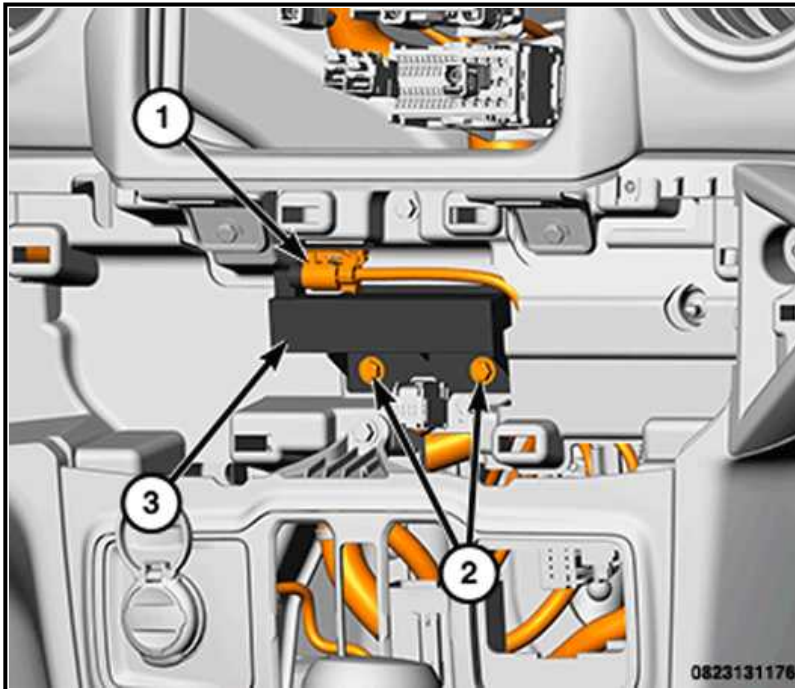
1. If the power lock system functions with the power lock switch, but not with the RKE transmitter, proceed to diagnosis of the RKE transmitter.
2. If the RKE transmitter checks okay, proceed to diagnosis of the RF-Hub. The use of a diagnostic scan tool and the appropriate diagnostic information are required.

ANTENNA, PASSIVE ENTRY

REMOVAL AND INSTALLATION

INSTRUMENT PANEL

REMOVAL AND INSTALLATION



REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the instrument panel center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#) .
3. Disconnect the wire harness connector (1).
4. Remove the fasteners (2) and remove the antenna (3).

INSTALLATION

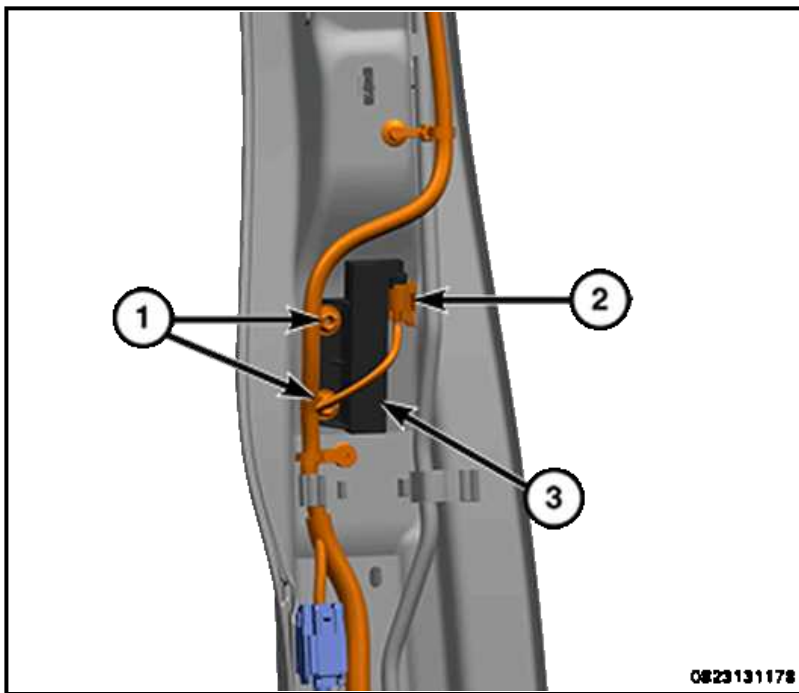
1. Install the antenna (3) and install the fasteners (2).
2. Connect the wire harness connector (1).
3. Install the instrument panel center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

B-PILLAR

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the upper B-pillar trim. Refer to [PANEL, B-PILLAR TRIM, LOWER, REMOVAL AND INSTALLATION](#) [PANEL, B-PILLAR TRIM, UPPER, REMOVAL AND INSTALLATION](#) .



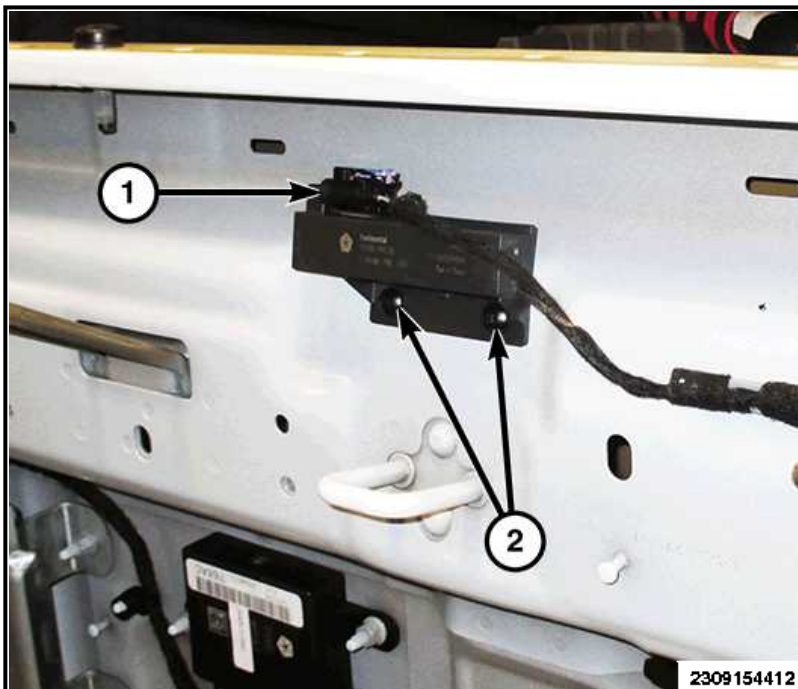
3. Disconnect the wire harness connector (2).
4. Remove the fasteners (1) and remove the antenna (3).

INSTALLATION

1. Install the antenna (3) and install the fasteners (1).
2. Connect the wire harness connector (2).
3. Install the upper B-pillar trim. Refer to [PANEL, B-PILLAR TRIM, LOWER, REMOVAL AND INSTALLATION](#) [PANEL, B-PILLAR TRIM, UPPER, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

CAB BACK PANEL

REMOVAL AND INSTALLATION



REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .

2. Remove the cab back panel, Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .
3. Disconnect the wire harness connector (1).
4. Remove the fasteners (2) and remove the antenna.

INSTALLATION

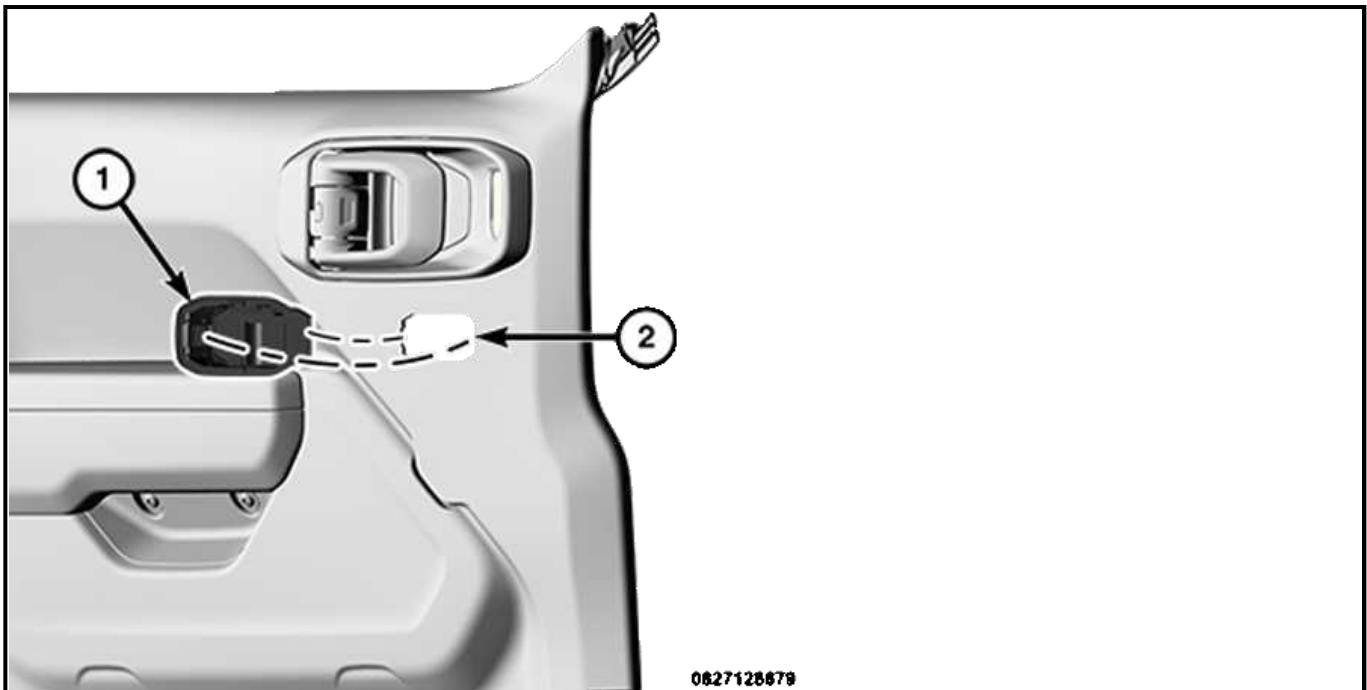
1. Install the antenna and install the fasteners (2).
2. Connect the wire harness connector (1).
3. Install the cab back panel, Refer to [PANEL, CAB BACK TRIM, REMOVAL AND INSTALLATION](#) .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

SWITCH, LOCK

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL



1. Using a trim stick or equivalent, remove the switch (1) from the trim panel (2).
2. Disconnect the wire harness connector from the switch and remove from the vehicle.

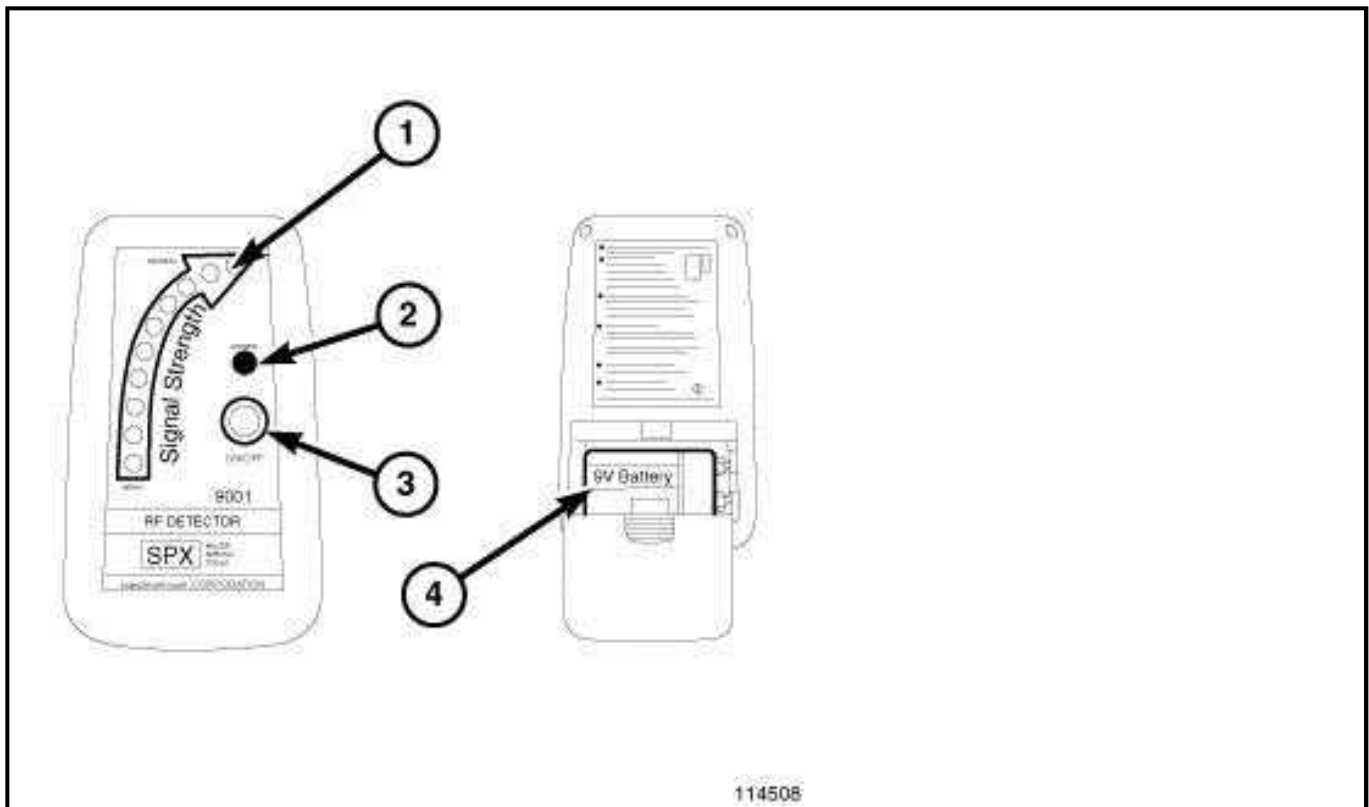
INSTALLATION

1. Position the switch to the door panel and connect the wire harness connector.
2. Install the switch into the trim panel and seat the locking tabs fully.

TRANSMITTER, INTEGRATED KEY FOB

DIAGNOSIS AND TESTING

KEYFOB TRANSMITTER



Use a Radio Frequency Detector such as special tool (special tool #9001, Rf Detector) to confirm that the Remote Keyless Entry (RKE) transmitter is functioning. Typical testing distance is 30.5 centimeters (12 inches).

1. Position the transmitter the appropriate distance from the special tool.
2. Depress any transmitter button, then test each button individually. The special tool will issue an audible beep tone if a satisfactory radio signal strength that lights five or more Light Emitting Diode (LED) units is detected.
3. Repeat Step 2 three times. If the transmitter fails any of the signal strength tests, use a diagnostic scan tool and the appropriate diagnostic information to complete further diagnosis.

KEY FOB IDENTIFICATION PROCEDURE

"Key FOB Identification" procedure located in the RF-Hub "Misc Functions" menu: The "Key FOB Identification" procedure should be used in the event that you need to confirm if a specific key fob is programmed to the vehicle and how many key fob programming slots are available.

When to perform this procedure: Performing this procedure will determine if the fob being programmed or reviewed belongs to this vehicle or is a blank.

- Before programming a new key fob. This could be due to the customer requesting an additional fob or a replacement fob. This will identify if the fob to be programmed to the vehicle is virgin and if it can be programmed.
- When troubleshooting or diagnosing a customer complaint for key fob issues such as key fob inoperative. This will determine if the key fob that the customer brought in for service belongs to the vehicle.

This procedure returns two pieces of information that will help root cause a key fob concern:

1. The first line of Information tells the technician whether the key fob is programmed to that vehicle (Learned), key not programmed to the vehicle (Not Learned), or not programmed to any vehicle (Blank), used or previously programmed to another vehicle (No FOB).
2. The second line of information is additional information based from the first line. This second line of information is useful if the fob is programmed to that vehicle as it shows what slot the key fob is programmed to.

STANDARD PROCEDURE

KEY FOB PROGRAMMING

NOTE: Do not put a Laptop or other wireless device (cell phone, cell phone, audio device, etc.) on top of or near the center console (between the seats to the dash). The Low Frequency (LF) antenna is below the center console and these devices may interrupt programming. Make sure that the key fob that is being programmed is inside the car away from nearby consumer electronics. Disconnect aftermarket cell phone chargers before attempting to program the key fob.

Using Service Library, obtain a Personal Identification Number (PIN) prior to starting the programming routine.

Sitting in the vehicle with the doors closed is a requirement for this routine to complete properly.

The key fob must be held against the Keyless Ignition Node (KIN) during key fob programming.

1. Using the diagnostic scan tool, select the Radio Frequency Hub (RF-Hub).
2. Select the "Miscellaneous Functions" tab.
3. Select and run the "Program Ignition FOBs" procedure and follow the screen prompts.

If the key fob fails to program or is inoperative. Refer to [**DIAGNOSIS AND TESTING**](#).

2021 ACCESSORIES AND BODY, CAB

Power Mirrors (Service Information) - Gladiator

DESCRIPTION AND OPERATION

EXTERIOR MIRRORS

DESCRIPTION



The interior and exterior power mirror systems are comprised of the following components:

COMPONENT INDEX

1.	Refer to BODY CONTROL MODULE (BCM) .
2.	Refer to POWER EXTERIOR REARVIEW MIRROR .
3.	Refer to INSTRUMENT PANEL CLUSTER (IPC) .
4.	Refer to POWER MIRROR SWITCH .

On vehicles equipped with the Electrochromatic (EC) mirror, the EC feature automatically changes reflectance of the internal mirror to provide maximum night vision, while giving relief from glare by headlamps from the rear of the vehicle during night driving.

An ambient photo-light sensor indicates the light intensity in front of the driver and from behind the driver. The ambient photo-light sensor is located behind the glass on the face of the mirror and is not visible. There is no switch or hard button on the mirror to turn the EC function on or off. When the difference between the two light levels becomes too great (the light level received at the rear of the mirror is much higher than that at the front of the mirror), the mirror begins to darken. The mirror also monitors the backup lamp circuit, and will automatically disable its self-dimming feature whenever the transmission gear position is in the REVERSE.

OPERATION

Bus Communication

The BCM determines the ignition status and the gear status based on their associated Controller Area Network (CAN) signals. The BCM will transmit the enable/disable signal over the Local Interface Network (LIN) bus to the interior mirror. The EC mirror will read the internal signal for the sensor values and determine the ratio between the forward and backward light intensity, along with the enable signal coming from the BCM, to determine the reflecting mode. The EC mirror then sends the internal EC mirror status signal over the LIN bus. The BCM receives the signal from the EC mirror and determine if errors have been reported.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM is the gateway for bus communications. The BCM is also the power mirror enabler by way of a hardwired circuit to the power mirror relay.

Inputs

- Receives input information over the LIN bus from the mirror switch to operate the mirrors.
- Reverse gear status input from the Powertrain Control Module (PCM) obtained over the CAN bus from the Transmission Control Module (TCM) if equipped with an automatic transmission or the Neutral Position Sensor (NPS) if equipped with a manual transmission.
- Receives LIN bus input from Combined Rear View Mirror Module (CRVMM) when the auto dimming feature is ON.

Outputs

- Sends left and right turn signal requests to the exterior mirrors.
- Sends the PRNDL signal over the LIN bus to the CRVMM.
- Sends a request to enable the Auto Dimming feature by transmitting a LIN bus message to the CRVMM.
- Broadcasts the EC mirror status over the CAN-Interior High Speed (CAN-IHS) bus.
- Power mirror relay control output.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [COMPONENT INDEX](#).

Inputs

- Bus message indicating that the EC is enabled from the CRVMM.
- Reverse gear status input from the PCM obtained over the CAN bus from the TCM if equipped with an automatic transmission or the NPS if equipped with a manual transmission.

Outputs

- The IPC sends a request to activate the EC feature by transmitting a message over the LIN bus communications network to the CRVMM.
- The IPC sends a LIN PRNDL message to the CRVMM. The PRNDL is acquired by the IPC over the bus network by its own gear status indication as well as a CAN-Chassis (CAN-C) bus shift lever position message.
- Outputs to the mirror switch for backlighting enable/disable.

POWER EXTERIOR REARVIEW MIRROR

POWER EXTERIOR REARVIEW MIRROR

Refer to [COMPONENT INDEX](#).

The door mirrors can be electrically adjusted in two directions using a joystick control located in the door control switch bank on the driver side: a selection knob makes it possible to choose either the left or the right mirror. The joystick controls two electrical motors located in each of the two mirrors.

One motor in each mirror controls horizontal (left and right) movement, while the second motor controls vertical (up and down) movement.

Each power mirror articulation mechanism is driven by two individual Direct Current (DC) reversible electric motors. The mirror motors also incorporate clutches that protect the motor by disengaging the drive whenever the travel limits of the swivel have been reached. When battery current and ground are output from the control switch to the two motor terminals, the motor rotates in one direction. When the switch output polarity to the motor connections are reversed, the motor rotates in the opposite direction.

Turn signal control is managed by the BCM while the Blind Spot Monitor (BSM) indicator is managed by the BSM module located within the tail lamp.

POWER MIRROR SWITCH

POWER MIRROR SWITCH

Refer to [COMPONENT INDEX](#).

The power mirror switch circuitry within the driver side front door power switch receives power from the BCM. The power mirror switch circuitry also has a path to ground at all times through a take out and eyelet terminal of the body wire harness that is secured to the body sheet metal. Mirror switch voltage supply is from the Power Distribution Center (PDC). The backlighting for the switch is an input from the IPC. The mirror switch has two Light Emitting Diode (LED) lights to indicate which outside mirror has been selected for adjustment.

The power mirror control switch determines which motor will be energized and the direction in which the motor will be driven.

The latching power mirror switch has three positions:

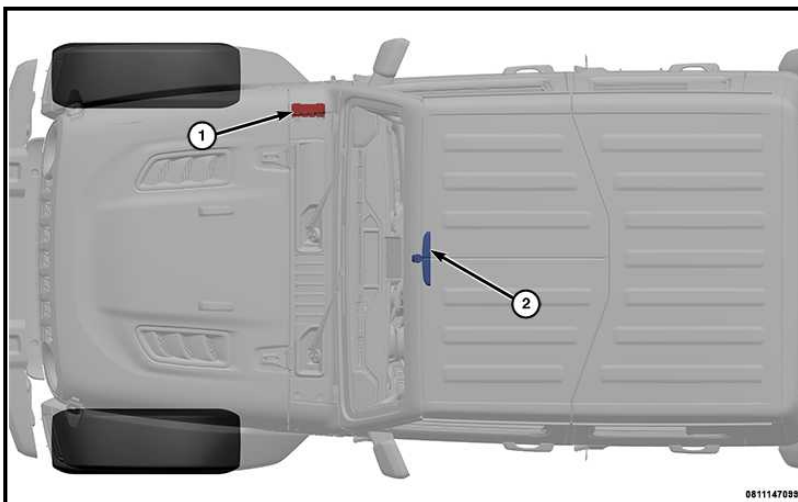
1. Driver
2. Passenger
3. Neutral

The non-latching mirror adjustment switch has four positions:

1. Up
2. Down
3. Left
4. Right

INTERIOR MIRRORS

DESCRIPTION



The interior power mirror system is comprised of the following components:

COMPONENT INDEX

1.	Refer to BODY CONTROL MODULE (BCM) .
2.	Refer to COMBINED REAR VIEW MIRROR MODULE (CRVMM) WITH INTERIOR REARVIEW MIRROR .

On vehicles equipped with the customer programmable Electrochromatic (EC) mirror, the EC feature automatically changes reflectance of the internal and external mirror (if equipped) to provide maximum night time vision, while giving relief from glare caused by headlights from the rear of the vehicle during night driving. The windshield mounted EC mirror is packaged with the CRVMM assembly.

Besides the mirror glass, the EC mirror includes two photocell sensors, the electronic mirror control circuitry and the hardware necessary to communicate as a Local Interface Network (LIN) slave node on the LIN data bus.

OPERATION

The EC mirror can be turned ON and OFF through the settings in the radio. The EC mirror will always turn ON by default at the onset of a new ignition ON cycle. The automatic dimming mirror circuitry also senses the backup lamp circuit, and will automatically disable its self-dimming feature whenever the transmission gear selector is in the REVERSE position.

The ambient photocell sensor of the mirror faces forward, to detect the outside light levels through the windshield glass. A second headlamp photocell sensor is used to detect the light level received at the rear window side of the mirror. When the mirror control circuitry detects that the difference between the two sensed light levels has become too great (the light level received at the rear of the mirror is much higher than that at the front of the mirror) the mirror begins to darken. A thin layer of EC material between two pieces of conductive glass make up the face of the mirror.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to COMPONENT INDEX .

The BCM is used in the power mirror system for enabling the EC mirror auto dim feature. The BCM sets the proper signals over the LIN bus to the CRVMM to enable this feature.

Inputs

- Command Ignition State
- Vehicle configuration data
- Feature request configuration from the Radio
- Configuration status (ON/OFF) requests from the Radio
- Transmission PRNDL and reverse gear status position from the Transmission Control Module (TCM)
- CRVMM EC mirror Status
- Operational status and reflectance value of the EC sensors from the CRVMM
- CRVMM error report signal

Outputs

- Vehicle configuration information
- EC mirror Auto Dim enable/disable to the CRVMM
- EC mirror status
- Commanded ignition status
- PRNDL status to the CRVMM
- Mirror enable request to the CRVMM

COMBINED REAR VIEW MIRROR MODULE (CRVMM) WITH INTERIOR REARVIEW MIRROR

COMBINED REAR VIEW MIRROR MODULE (CRVMM) WITH INTERIOR REARVIEW MIRROR

Refer to [COMPONENT INDEX](#).

The CRVMM receives the EC enable signal from the BCM and then will determine the reflecting mode. The CRVMM internal EC mirror reads the photo-light signals sensor for values to determine the ratio between the forward and backward light intensity.

Inputs

- Vehicle configuration information from the BCM
- EC mirror Auto Dim enable/disable from the BCM
- Commanded ignition status
- PRNDL status from the BCM
- Mirror enable request from the BCM

Outputs

- EC mirror status to the BCM
- Outside mirror dimming enable signal to the BCM
- Operational status and reflectance value of the EC sensors to the BCM
- CRVMM error report signal to the BCM

MIRROR, AUTOMATIC DAY AND NIGHT

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

For removal and installation of the mirror. Refer to [MIRROR, REARVIEW, REMOVAL AND INSTALLATION](#).

MIRROR, OUTSIDE REARVIEW

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

For removal and installation of the mirror. Refer to [MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION](#) [MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION](#).

SWITCH, MIRROR

DIAGNOSIS AND TESTING

POWER MIRROR SWITCH

Perform the following troubleshooting steps to help diagnose any wiring or component concerns:

1. Remove the power mirror switch.
2. Disconnect the wire harness connector from the switch.
3. Using an ohmmeter, test for continuity between the terminals of the switch.
4. If results shown in the table are not obtained, replace the switch.

POWER MIRROR SWITCH TEST

SWITCH POSITION	CONTINUITY BETWEEN PINS	
MIRROR SELECT SWITCH IN "LEFT" POSITION	B	
UP		6-16
		15-13
DOWN		8-16
		15-13
LEFT		6-16
		15-13
RIGHT		8-13
		15-16
MIRROR SELECT SWITCH IN "RIGHT" POSITION	B	
UP		B
		14-16
		17-13
DOWN		14-13
		17-16
LEFT		7-16
		14-13
RIGHT		7-13
		14-16

DRIVER POWER FOLDING MIRROR

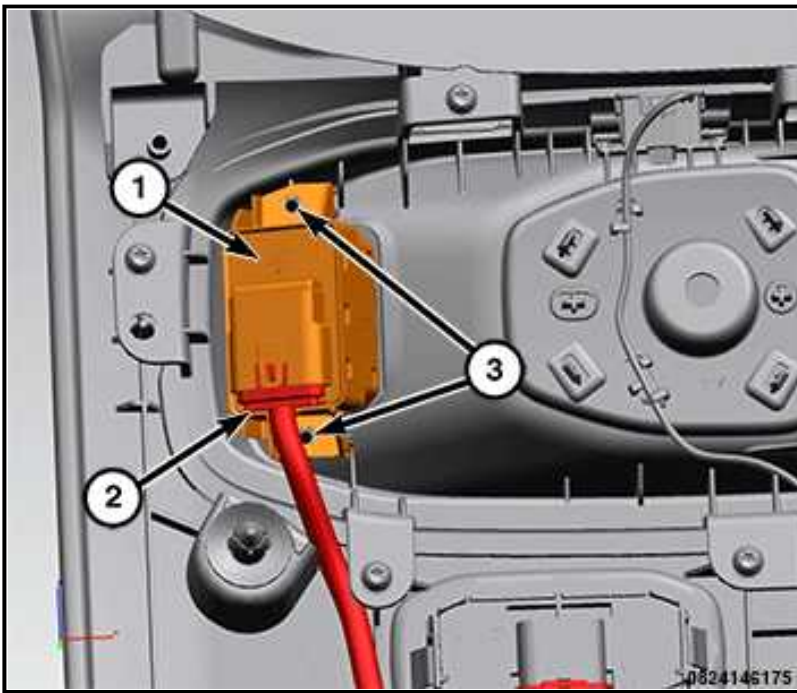
MIRROR MOVEMENT	CONTINUITY BETWEEN PINS
CLOSING	11-13
B	12-16

PASSENGER POWER FOLDING MIRROR

MIRROR MOVEMENT	CONTINUITY BETWEEN PINS
CLOSING	1-13
B	10-16

REMOVAL AND INSTALLATION**REMOVAL AND INSTALLATION****REMOVAL**

1. Remove the left front door trim panel. Refer to **PANEL, DOOR TRIM, REMOVAL AND INSTALLATION** .



2. Remove the power mirror switch fasteners (3).
3. Remove the switch assembly (1) from the door panel trim.

INSTALLATION

1. Position the switch assembly to the trim panel.
 2. Install the fasteners and tighten securely.
 3. Install the left front door trim panel. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#) .
-

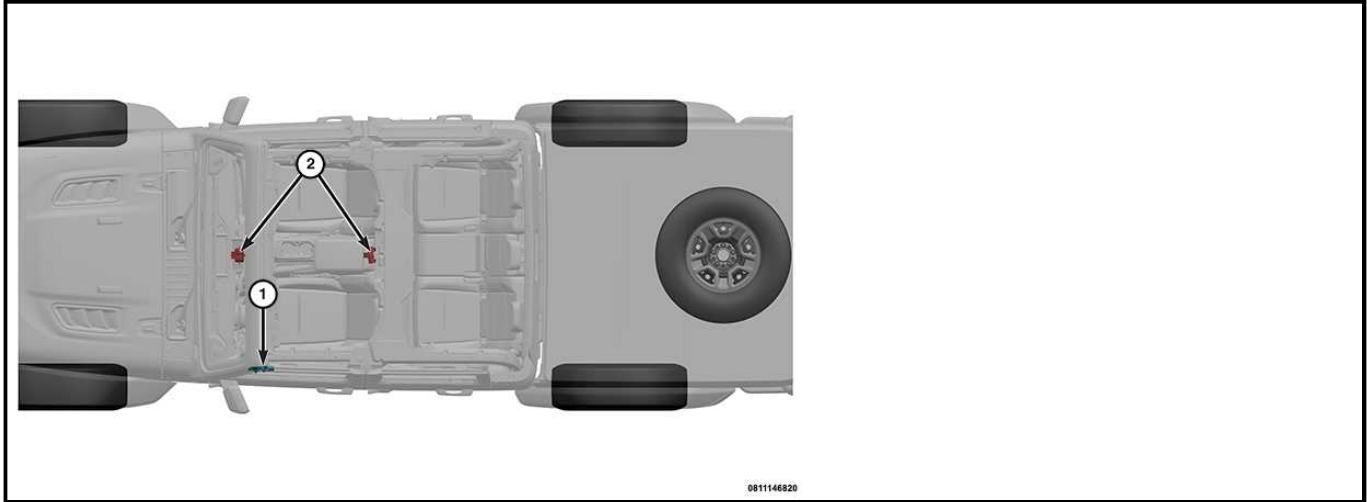
2021 ACCESSORIES AND EQUIPMENT

Power Windows - Service Information - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The following are some of the components that make up the power window system:

COMPONENT INDEX

1.	Refer to POWER WINDOW MOTOR - One for each door.
2.	Refer to POWER WINDOW SWITCH - Front and Rear.

The power window system allows each of the door windows to be raised and lowered electrically by actuating a switch on the instrument panel center bezel, or on the rear bezel of the center floor console. A master switch on the instrument panel allows the driver to raise or lower each of the passenger door windows and to lock out the individual switches on the passenger doors from operation. The power window system receives battery feed through a circuit breaker, only when the ignition switch is in the ON position.

The power window system includes the power window switches, the circuit breaker, and the power window motors inside each door. The power switches are similar in design and function, and are serviced in similar manners. The power motors are similar as well and can be serviced separately from the window regulators.

The front power window switches feature manual window operation and express window operation. The rear window switches are manual window operation only.

OPERATION

POWER WINDOW MOTOR

POWER WINDOW MOTOR

Refer to **COMPONENT INDEX**.

Door window lift motors use permanent type magnets. The B+ and ground applied at the motor terminal pins will cause the motor to rotate in one direction. Reversing current through the motor terminals will cause the motor to rotate in the opposite direction. The motors receive a B+ feed and ground from the window switch.

When equipped, one power window motor exists for each door.

POWER WINDOW SWITCH

POWER WINDOW SWITCH

Refer to [COMPONENT INDEX](#).

The power window system allows each of the door windows to be raised and lowered electrically by actuating a switch on each door panel. A master switch on the center console allows the driver to raise or lower each door window. The power window system operates only when the ignition switch is in the RUN or ACCESSORY position. The Body Control Module (BCM) manages a relay driver in the Power Distribution Center (PDC) to provide power to the window switches.

The power window switches control the battery and ground feeds to the power window motors. The rear center console power window switches receives its battery and ground feeds through the circuitry of the front center console window switch. When the power window lockout switch is in the LOCK position, the battery feed for the rear window switch is interrupted.

DIAGNOSIS AND TESTING

POWER WINDOWS

For complete circuit diagrams, refer to the appropriate wiring information.

POWER WINDOW MOTOR DIAGNOSIS

Suggested process to diagnose inoperative power windows:

1. Connect the diagnostic scan tool to check for Diagnostic Trouble Codes (DTCs) and to validate operation of the power window system. Resolve any DTCs and retest the power window operation.
2. Check for damaged fuses and replace as needed.
3. Confirm the power to the motor and the motor ground integrity.
4. Using the diagnostic scan tool, confirm that the window switch actuation is recognized.
5. If the power window motor is receiving proper current and proper ground and does not operate, proceed with motor test.
 1. Remove front door trim panel to gain access to power window motor wire connector.
 2. Disconnect the power window motor wire harness connector from door harness.
 3. Using two jumper wires, connect one to a battery (+) source and the other to a good ground (-).
 4. Connect the Negative (-) jumper probe to one of the motor connector terminals.
 5. Momentarily touch the Positive (+) jumper probe to the other motor connector terminal.

When positive probe is connected, the motor should rotate in one direction to either move window up or down. If window is all the way up or down the motor will grunt and the inner door panel will flex when actuated in that one direction.

6. Reverse jumper probes at the motor connector terminals and window should now move in opposite direction. If window does not move or grunt, replace the motor. If the window moves completely up or down, reverse the jumper probes and cycle window to the opposite position to verify full operation. If motor grunts and does not move, verify that regulator is not binding.

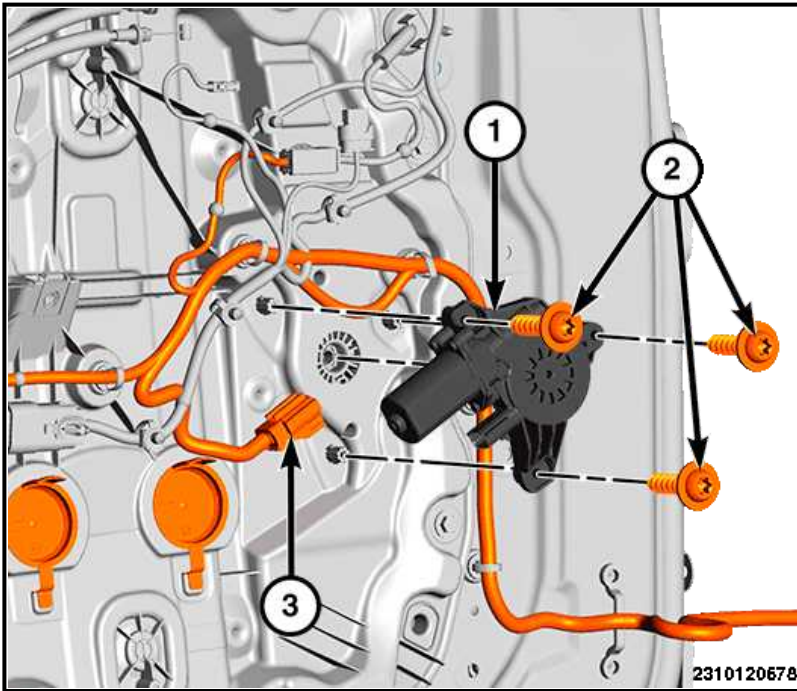
MOTOR, WINDOW REGULATOR

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Partially raise or lower the door glass to relieve tension on motor and cables. Secure the glass as necessary.
2. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
3. Remove the door interior trim panel or. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#) . for the appropriate procedure. Refer to [PANEL, REAR DOOR TRIM, REMOVAL AND INSTALLATION](#) .



4. Disconnect the wire harness connector (3).
5. Remove the fasteners (2) that secure the power window motor (1) to the carrier plate.
6. Using a flat bladed tool, lightly pry the cable drive away from the motor and remove the motor and gear assembly.

NOTE: The power window motor may need to be actuated momentarily to line up the gear in the drive assembly with the regulator.

INSTALLATION

1. Connect the wire harness connector (3) to the motor.
2. Position the power window motor and gear assembly on the carrier plate aligning the drive gear with the regulator.
3. If necessary, temporarily connect the battery to actuate the motor.
4. Install and tighten the fasteners (2) that secure the power window motor and gear assembly to the carrier plate.
5. Install the door interior trim panel or. Refer to [PANEL, DOOR TRIM, REMOVAL AND INSTALLATION](#) . for the appropriate procedure. Refer to [PANEL, REAR DOOR TRIM, REMOVAL AND INSTALLATION](#) .
6. Connect the negative battery cable(s). Refer to the appropriate service information .

SWITCH, POWER WINDOW

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - POWER WINDOW SWITCH

Remove the power window switch. Refer to **SWITCH, POWER WINDOW, REMOVAL AND INSTALLATION**. Using an ohmmeter, refer to Window Switch Continuity Charts to determine if continuity is correct. If the results are not obtained, replace the switch.

The master window switch has an Auto-Down feature. Actuation of the master switch to the second down position will move the drivers side window completely down. The electronic switch will automatically disconnect the motor approximately one second after the window bottoms out. Failure of the electronic switch to detect stall current will cause the switch to disconnect after approximately 13 seconds. The auto down function can be canceled by any movement of that switch. The LOCK feature for the rear window switch is internal to the master switch. If the Lock is engaged the rear switch assembly is disabled and will not illuminate.

SWITCH ACTIVATION

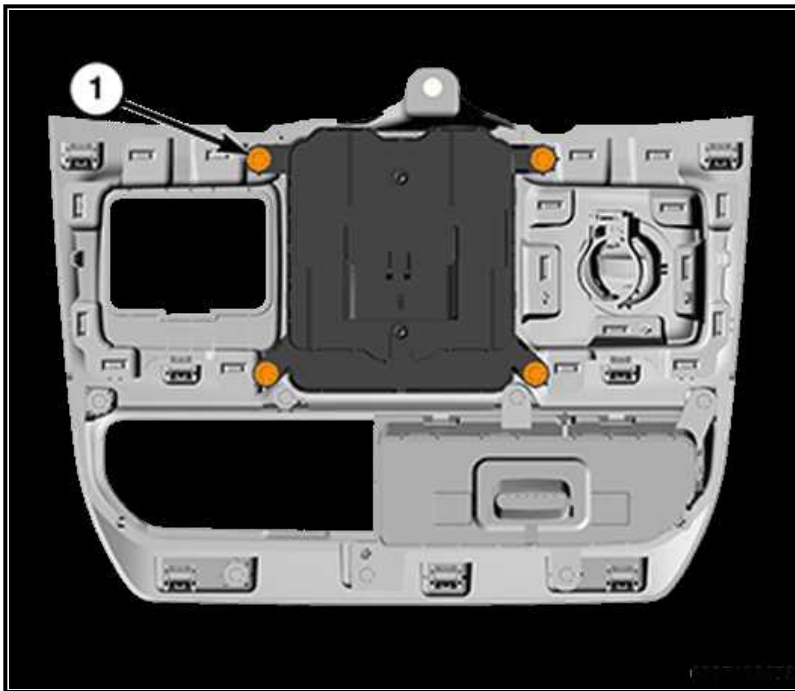
SWITCH POSITION	CONTINUITY BETWEEN (terminal)
Rear Right Up	1 AND 12
Rear Right Down	2 AND 12
Rear Left Up	8 AND 12
Rear Left Down	9 AND 12
Driver Up	14 AND 12
Driver Down	13 AND 12
Passenger Up	7 AND 12
Passenger Down (switch powered up)	3 AND 12
Driver Down (switch powered up)	13 AND 12

REST POSITION

SWITCH POSITION	CONTINUITY BETWEEN (terminal)
Rear Right Up	1 AND 4
Rear Right Down	2 AND 4
Rear Left Up	8 AND 4
Rear Left Down	9 AND 4
Driver Up	14 AND 4
Driver Down	13 AND 4
Passenger Up	7 AND 4
Passenger Down (switch powered up)	3 AND 4
Driver Down (switch powered up)	13 AND 4

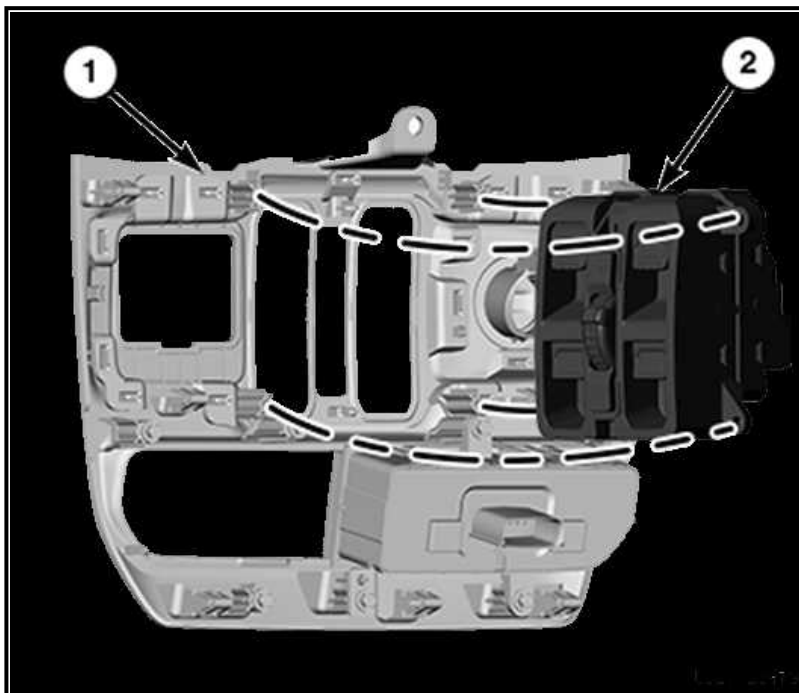
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION - FRONT



REMOVAL

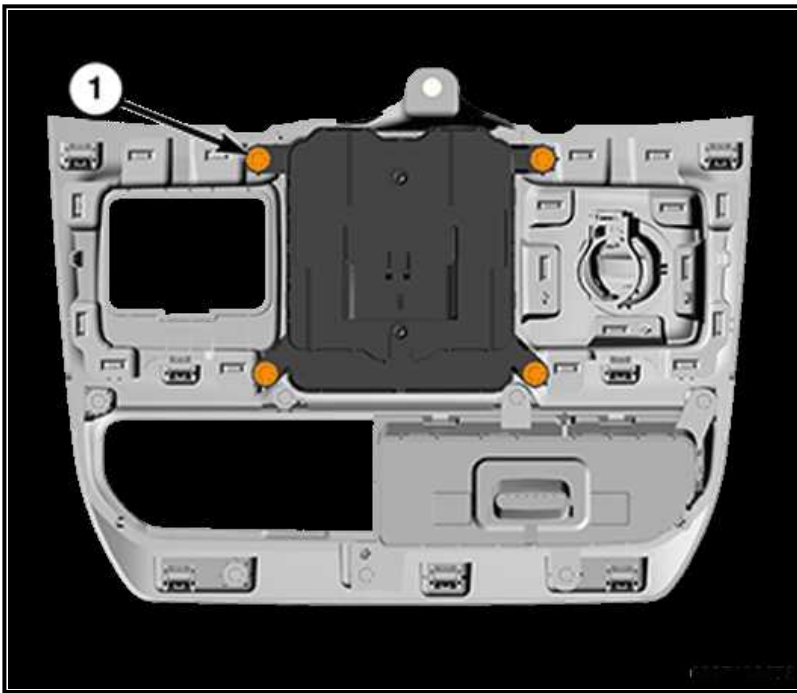
1. Remove the instrument panel center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#).
2. Remove the switch fasteners (1).



3. Separate and remove the switch assembly (2) from the trim (1).

INSTALLATION

1. Position the switch assembly (2) back onto the trim panel (1).

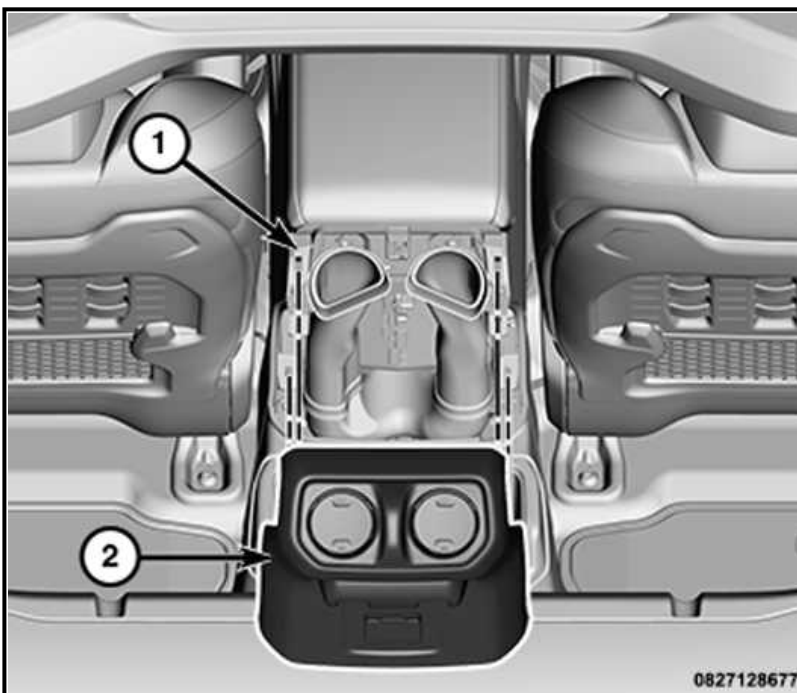


2. Install the fasteners (1).
3. Install the instrument panel center trim. Refer to [PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION](#) .

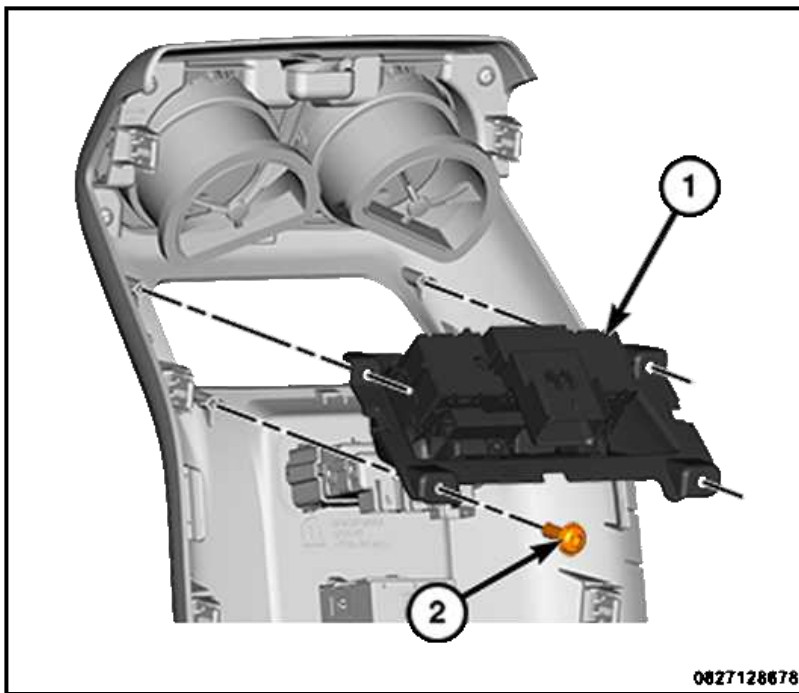
REMOVAL AND INSTALLATION - REAR

REMOVAL

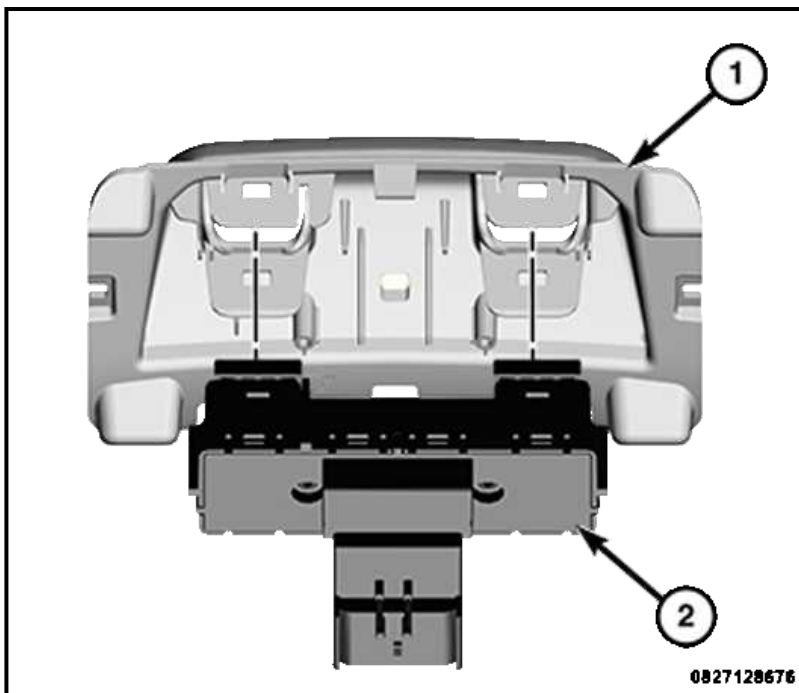
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove center console end cap. Refer to [CONSOLE, FLOOR, REMOVAL AND INSTALLATION](#) [CONSOLE, FLOOR, END CAP, REMOVAL AND INSTALLATION](#) .



3. Using a trim tool (special tool #C-4755, Trim Stick) or equivalent, separate the retaining clips and remove the rear console bezel (2) from the rear of the console (1).
4. Disconnect the wire harness connectors.



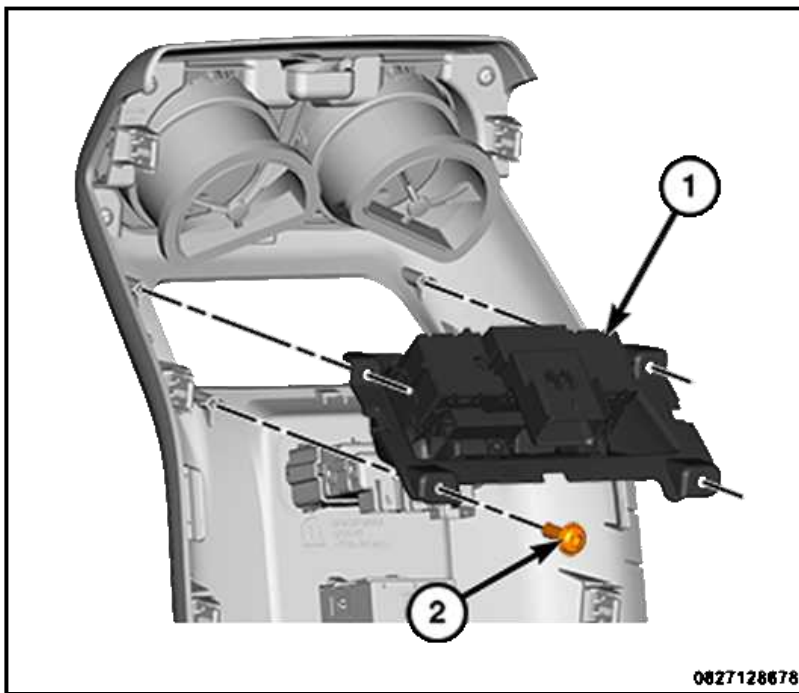
5. Remove the fasteners (2) and remove the switch assembly (1) from the rear trim.



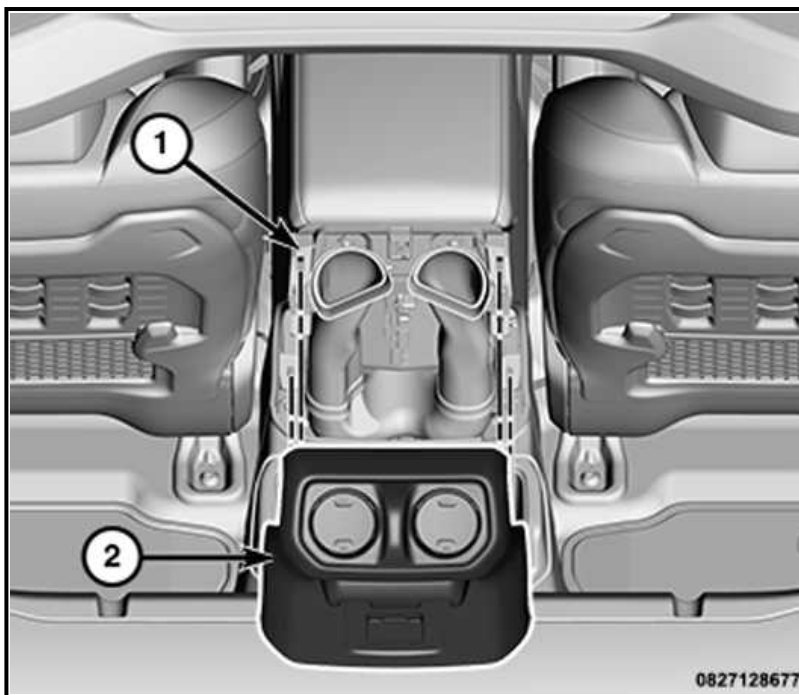
6. Release the tabs and remove the switch (2) from the bezel (1).

INSTALLATION

1. Install the switch (2) onto the bezel (1) and seat the retaining clips.



2. Install the switch assembly (1) onto the rear console trim and install the fasteners (2).



3. Connect the wire harness connectors.

4. Install the rear console trim assembly (2) onto the console (1) and seat the retaining clips.

5. Connect the negative battery cable(s). Refer to the appropriate service information .

2021 ACCESSORIES AND BODY, CAB

Radio Frequency Module (RF HUB) - Diagnostic Code Index - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B1A08-00</u>	RKE FOB 1 PERFORMANCE
<u>B1A09-00</u>	RKE FOB 2 PERFORMANCE
<u>B1A0A-00</u>	RKE FOB 3 PERFORMANCE
<u>B1A0B-00</u>	RKE FOB 4 PERFORMANCE
<u>B1A0C-00</u>	RKE FOB 5 PERFORMANCE
<u>B1A0D-00</u>	RKE FOB 6 PERFORMANCE
<u>B1A0E-00</u>	RKE FOB 7 PERFORMANCE
<u>B1A0F-00</u>	RKE FOB 8 PERFORMANCE
<u>B1A10-00</u>	RKE FOB 1 BATTERY LOW
<u>B1A11-00</u>	RKE FOB 2 BATTERY LOW
<u>B1A12-00</u>	RKE FOB 3 BATTERY LOW
<u>B1A13-00</u>	RKE FOB 4 BATTERY LOW
<u>B1A14-00</u>	RKE FOB 5 BATTERY LOW
<u>B1A15-00</u>	RKE FOB 6 BATTERY LOW
<u>B1A16-00</u>	RKE FOB 7 BATTERY LOW
<u>B1A17-00</u>	RKE FOB 8 BATTERY LOW
<u>B1A24-00</u>	KEY NOT PROGRAMMED
<u>B1A71-01</u>	PASSIVE ENTRY ANTENNA 1-GENERAL ELECTRICAL FAILURE
<u>B1A71-11</u>	PASSIVE ENTRY ANTENNA 1-CIRCUIT SHORT TO GROUND
<u>B1A71-12</u>	PASSIVE ENTRY ANTENNA 1-CIRCUIT SHORT TO BATTERY
<u>B1A71-13</u>	PASSIVE ENTRY ANTENNA 1-CIRCUIT OPEN
<u>B1A72-01</u>	PASSIVE ENTRY ANTENNA 2-GENERAL ELECTRICAL FAILURE
<u>B1A72-11</u>	PASSIVE ENTRY ANTENNA 2-CIRCUIT SHORT TO GROUND
<u>B1A72-12</u>	PASSIVE ENTRY ANTENNA 2-CIRCUIT SHORT TO BATTERY
<u>B1A72-13</u>	PASSIVE ENTRY ANTENNA 2-CIRCUIT OPEN
<u>B1A73-01</u>	PASSIVE ENTRY ANTENNA 3-GENERAL ELECTRICAL FAILURE
<u>B1A73-11</u>	PASSIVE ENTRY ANTENNA 3-CIRCUIT SHORT TO GROUND
<u>B1A73-12</u>	PASSIVE ENTRY ANTENNA 3-CIRCUIT SHORT TO BATTERY
<u>B1A73-13</u>	PASSIVE ENTRY ANTENNA 3-CIRCUIT OPEN
<u>B1A74-01</u>	PASSIVE ENTRY ANTENNA 4-GENERAL ELECTRICAL FAILURE
<u>B1A74-11</u>	PASSIVE ENTRY ANTENNA 4-CIRCUIT SHORT TO GROUND
<u>B1A74-12</u>	PASSIVE ENTRY ANTENNA 4-CIRCUIT SHORT TO BATTERY
<u>B1A74-13</u>	PASSIVE ENTRY ANTENNA 4-CIRCUIT OPEN
<u>B1A76-11</u>	B1A76-11 - REMOTE START ANTENNA CIRCUIT- CIRCUIT SHORT TO GROUND
<u>B1A76-13</u>	REMOTE START ANTENNA CIRCUIT-CIRCUIT OPEN
<u>B1A7B-01</u>	IMMOBILIZER ANTENNA (KIN/IGNM)-GENERAL ELECTRICAL FAILURE
<u>B1A7D-01</u>	START BUTTON-GENERAL ELECTRICAL FAILURE
<u>B1A7D-2A</u>	START BUTTON-STUCK
<u>B215B-12</u>	IGNITION RUN/START 2 CONTROL-CIRCUIT SHORT TO BATTERY
<u>B215B-14</u>	IGNITION RUN/START 2 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN

DTC	Description
<u>B2199-16</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B2199-17</u>	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B21DD-84</u>	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
<u>B21DD-85</u>	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
<u>B2205-00</u>	ORIGINAL VIN MISSING / MISMATCH
<u>B222C-00</u>	VEHICLE CONFIGURATION NOT PROGRAMMED
<u>B22A0-49</u>	RF HUB-INTERNAL ELECTRONIC FAILURE
<u>B22A9</u>	00-ECU INTERNAL PERFORMANCE
<u>B259A-11</u>	FRONT LEFT DOOR HANDLE SENSE-CIRCUIT SHORT TO GROUND
<u>B259A-13</u>	FRONT LEFT DOOR HANDLE SENSE-CIRCUIT OPEN
<u>B259B-11</u>	FRONT RIGHT DOOR HANDLE SENSE-CIRCUIT SHORT TO GROUND
<u>B259B-13</u>	FRONT RIGHT DOOR HANDLE SENSE-CIRCUIT OPEN
<u>B25A3-00</u>	FRONT LEFT DOOR HANDLE SENSOR
<u>B25A4-00</u>	FRONT RIGHT DOOR HANDLE SENSOR
<u>C1501-07</u>	TIRE PRESSURE SENSOR 1-MECHANICAL FAILURES
<u>C1501-16</u>	TIRE PRESSURE SENSOR 1-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C1501-31</u>	TIRE PRESSURE SENSOR 1-NO SIGNAL
<u>C1501-4B</u>	TIRE PRESSURE SENSOR 1-OVER TEMPERATURE
<u>C1502-07</u>	TIRE PRESSURE SENSOR 2-MECHANICAL FAILURES
<u>C1502-16</u>	TIRE PRESSURE SENSOR 2-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C1502-31</u>	TIRE PRESSURE SENSOR 2-NO SIGNAL
<u>C1502-4B</u>	TIRE PRESSURE SENSOR 2-OVER TEMPERATURE
<u>C1503-07</u>	TIRE PRESSURE SENSOR 3-MECHANICAL FAILURES
<u>C1503-16</u>	TIRE PRESSURE SENSOR 3-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C1503-31</u>	TIRE PRESSURE SENSOR 3-NO SIGNAL
<u>C1503-4B</u>	TIRE PRESSURE SENSOR 3-OVER TEMPERATURE
<u>C1504-07</u>	TIRE PRESSURE SENSOR 4-MECHANICAL FAILURES
<u>C1504-16</u>	TIRE PRESSURE SENSOR 4-CIRCUIT VOLTAGE BELOW THRESHOLD
<u>C1504-31</u>	TIRE PRESSURE SENSOR 4-NO SIGNAL
<u>C1504-4B</u>	TIRE PRESSURE SENSOR 4-OVER TEMPERATURE
<u>C151C-51</u>	TIRE PRESSURE SENSORS MISSING-NOT PROGRAMMED
<u>C151D-00</u>	TIRE PRESSURE SENSOR LOCATION UNDETERMINED
<u>C1597-00</u>	TPM SYSTEM DEACTIVATED - WINTER MODE
<u>C15CB-00</u>	FRONT AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE
<u>C15CC-00</u>	REAR AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE
<u>P0830-01</u>	CLUTCH PEDAL SWITCH-GENERAL ELECTRICAL FAILURE
<u>U0001-00</u>	CAN C BUS
<u>U0002-00</u>	CAN C BUS OFF PERFORMANCE
<u>U0100-00</u>	LOST COMMUNICATION WITH ECM/PCM
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0102-00</u>	LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD
<u>U0103-00</u>	LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0151-00</u>	LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)
<u>U0154-00</u>	LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

DTC	Description
<u>U0155-00</u>	LOST COMMUNICATION WITH CLUSTER-CCN
<u>U103C-00</u>	KIN-IGNM COMMUNICATION
<u>U115F-00</u>	LOST COMMUNICATION WITH DRIVER PRESENCE DETECTION MODULE
<u>U140E-00</u>	IMPLAUSIBLE VEHICLE CONFIGURATION DATA RECEIVED
<u>U1433-01</u>	IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED
<u>U1517-62</u>	BODY CONTROLLER SECRET CODE-SIGNAL COMPARE FAILURE
<u>U1517-87</u>	BODY CONTROLLER SECRET CODE-MISSING MESSAGE

2021 ACCESSORIES AND BODY, CAB

Radio Frequency Module (Rf Hub) - Dtcs B1A08-00 To B22A0-49 - Gladiator

DTC TROUBLESHOOTING

B1A08-00-RKE FOB 1 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.

8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#) .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test complete.

B1A09-00-RKE FOB 2 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), MODULE PROGRAMMING** .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .
- Test complete.

B1A0A-00-RKE FOB 3 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#) .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test complete.

B1A0B-00-RKE FOB 4 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), MODULE PROGRAMMING** .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .
- Test complete.

B1A0C-00-RKE FOB 5 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#) .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test complete.

B1A0D-00-RKE FOB 6 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), MODULE PROGRAMMING** .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .
- Test complete.

B1A0E-00-RKE FOB 7 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#) .

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test complete.

B1A0F-00-RKE FOB 8 PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- Upon detection of an out of sync condition between the Radio Frequency Hub Module (RFHM) and the Key Fob transceiver.

DEFAULT ACTION

- The RKE function is inoperative.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE PRESSES FROM KEY FOB WHEN OUT OF RANGE
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All Key Fobs used with this vehicle should be present during this test.

NOTE: To Press the ignition ON the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE KEY FOB

1. With the scan tool, erase the DTCs.
2. Press the ignition off.
3. Put the inoperative Key Fob in the vehicle.
4. With the good Key Fob, start and drive the vehicle above five miles per hour for one mile.
5. Press the ignition off.
6. Operate the inoperative Key Fob in all positions several times.
7. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace and program the Key Fob in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), MODULE PROGRAMMING](#).

No

- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).
- Test complete.

B1A10-00-RKE FOB 1 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B1A11-00-RKE FOB 2 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.

5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1A12-00-RKE FOB 3 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.

2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

B1A13-00-RKE FOB 4 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B1A14-00-RKE FOB 5 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#).

B1A15-00-RKE FOB 6 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B1A16-00-RKE FOB 7 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B1A17-00-RKE FOB 8 BATTERY LOW

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The Bus is awake.
- Every Remote Keyless Entry (RKE) message reception.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- If the battery in the Key Fob is low during key interrogation, with a valid key, this code will set. It may also set during a valid RKE button press.

DEFAULT ACTION

- RKE/Passive Functionality is inoperative.
- EVIC message: "FOB Low Battery".

POSSIBLE CAUSES

Possible Causes
LOW KEY FOB BATTERY
KEY FOB

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: Verify that the Key Fob in use is the Key Fob causing the DTC to set.

NOTE: All Key Fobs used with this vehicle should be present during this test.

1. With one of the owners known good Key Fobs in the vehicle, cycle (or press the KIN button with Keyless Go) the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the ignition off.
4. From inside the vehicle, operate the alleged inoperative Key Fob in all positions several times.
5. Press the ignition on.
6. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Key Fob battery.

Erase the DTC and operate the Key Fob buttons several times. If the DTC returns, replace and program the Key Fob using the scan tool.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B1A24-00-KEY NOT PROGRAMMED

THEORY OF OPERATION

Whenever a Key Fob is inserted in the Ignition Node Module (IGNM); or the Keyless Ignition Node (KIN) push button is pressed with the key inside the vehicle, the Radio Frequency Hub (RF-Hub) performs a self test and resynchronization routine. During the routine, the RF-Hub interrogates the Key Fob, performing various validity and performance tests. The repair of this fault condition relies on the programmed status of the Key Fob.

WHEN MONITORED

This diagnostic runs continuously when the following condition are met:

- The Radio Frequency Hub (RFHM) Module is awake.
- Battery voltage is between 6.0 - 16.0 volts.
- Interrogation of the Key Fob is completed in 2 ways:
 1. The radio frequency communication between the Key Fob and Radio Frequency Hub Module (RFHM) Module.

2. The Keyless Ignition Node (KIN), on the passive entry keyless go system uses low frequency communication between the Low Frequency antennas, Key Fob and Radio Frequency Hub Module (RFHM) Module.

SET CONDITION

- The RFHM receives the default secret key signal (no Key Fob is programmed to the RFHM) from a key Fob. Once set, this DTC will remain active until one valid key Fob is recognized by the RFHM.

DEFAULT ACTION

- Unable to transition the Ignition out of the Lock position.
- Keys are not programmed to the RFHM Module.

POSSIBLE CAUSES

Possible Causes
NO KEY FOB PROGRAMMED
RADIO FREQUENCY HUB MODULE (RFHM) REPLACED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: All KeyFobs used with this vehicle should be present during this test.

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. Press the lock/unlock button of the alleged inoperative Key Fob several times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. PROGRAM ALL KEY FOBS

NOTE: All Key Fobs that are to be used in this vehicle must remain on the front seat near the console during programming.

NOTE: The RF-Hub
must have a minimum of one
programmed Key Fob for this DTC to be stored.

1. With the scan tool, select "Misc. Functions", "Program Ignition Fob" and follow the instructions on the screen.
2. Program all Key Fobs that are to be used with this vehicle in accordance with Service Information.
3. Try each Key Fob that was programmed.

Do all Key Fobs operate properly?

Yes

- Test complete.

No

- With the scan tool perform the "RF-HUB", "Reset ECU" and repeat this test from the beginning.

B1A71-01-PASSIVE ENTRY ANTENNA 1-GENERAL ELECTRICAL FAILURE

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- The Passive Entry Antenna 1 is faulty, out of range, calibration is incorrect, and no other antennas have a short to battery or a short to ground condition.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 1
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to

follow the path of the circuit.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

7. ISOLATE AND CHECK THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

8. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR A SHORT TO THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [9](#)

9. REPLACE THE PASSIVE ENTRY ANTENNA 1 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **[RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#)** .

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Radio Frequency Hub Module (RF HUB) Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A71-11-PASSIVE ENTRY ANTENNA 1-CIRCUIT SHORT TO GROUND

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When the Passive Entry Antenna 1 Signal circuit is shorted to ground.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT SHORTED TO GROUND

Possible Causes
PASSIVE ENTRY ANTENNA 1
RADIO FREQUENCY HUB MODULE (RF HUB)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. DISCONNECT THE PASSIVE ENTRY ANTENNA 1 HARNESS CONNECTOR AND VERIFY ABILITY OF THE RF HUB TO DETECT THE SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC

1. The Electronic Control Unit (ECU) harness connectors must be connected to the ECU during this test step.
2. With the ignition in the off position, disconnect the sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display the SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC with the connector disconnected?

Yes

- Replace the faulty sensor in accordance with the Service Information. Refer to **ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION** .

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Go To [5](#)

5. REPLACE THE PASSIVE ENTRY ANTENNA 1 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to **ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION** .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A71-12-PASSIVE ENTRY ANTENNA 1-CIRCUIT SHORT TO BATTERY

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When the Passive Entry Antenna 1 Signal Circuit is shorted to Battery.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT SHORT TO VOLTAGE
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBK to press the Stop/Start button.

1. Press the ignition off.

2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.
6. Press the ignition on.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.
6. Press the ignition on.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

- Test complete.

B1A71-13-PASSIVE ENTRY ANTENNA 1-CIRCUIT OPEN

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 1 Signal circuit is open or shorted to the return circuit.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 1
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE (D920) PASSIVE ENTRY ANTENNA 1 SIGNAL CIRCUIT FOR A SHORT TO THE (D921) PASSIVE ENTRY ANTENNA 1 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [5](#)

5. REPLACE THE PASSIVE ENTRY ANTENNA 1 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to **ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION** .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A72-01-PASSIVE ENTRY ANTENNA 2-GENERAL ELECTRICAL FAILURE

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- The Passive Entry Antenna 2 is faulty, out of range, calibration is incorrect, or Passive Entry Antenna circuit is not shorted or open.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 2
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.

3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

7. ISOLATE AND CHECK THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

8. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR A SHORT TO THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [9](#)

9. REPLACE THE PASSIVE ENTRY ANTENNA 2 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [**MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION**](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .
- Test complete.

B1A72-11-PASSIVE ENTRY ANTENNA 2-CIRCUIT SHORT TO GROUND

For a complete PASSIVE ENTRY SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 2 Signal circuit is shorted to ground.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 2
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. DISCONNECT THE PASSIVE ENTRY ANTENNA 2 HARNESS CONNECTOR AND VERIFY ABILITY OF THE RF HUB TO DETECT THE SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC

1. The Electronic Control Unit (ECU) harness connectors must be connected to the ECU during this test step.
2. With the ignition in the off position, disconnect the sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display the SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC with the connector disconnected?

Yes

- Replace the faulty sensor in accordance with the Service Information. Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#).
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. REPLACE THE PASSIVE ENTRY ANTENNA 2 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [**ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION**](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A72-12-PASSIVE ENTRY ANTENNA 2-CIRCUIT SHORT TO BATTERY

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When the Passive Entry Antenna 2 Signal Circuit is shorted to Battery.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT SHORTED TO VOLTAGE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.
6. Press the ignition on.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.
6. Press the ignition on.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A72-13-PASSIVE ENTRY ANTENNA 2-CIRCUIT OPEN

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 2 Signal Circuit is open or shorted to the return circuit.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 2
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any

possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (D922) PASSIVE ENTRY ANTENNA 2 SIGNAL CIRCUIT FOR A SHORT TO THE (D923) PASSIVE ENTRY ANTENNA 2 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE PASSIVE ENTRY ANTENNA 2 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .
- Test complete.

B1A73-01-PASSIVE ENTRY ANTENNA 3-GENERAL ELECTRICAL FAILURE

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- The Passive Entry Antenna 3 is faulty, out of range, calibration is incorrect, or circuits shorted or open.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 3
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

7. ISOLATE AND CHECK THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

8. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR A SHORT TO THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. REPLACE THE PASSIVE ENTRY ANTENNA 3 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [**ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION**](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A73-11-PASSIVE ENTRY ANTENNA 3-CIRCUIT SHORT TO GROUND

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 3 Signal circuit is shorted to ground.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
ANOTHER ANTENNA SIGNAL CIRCUIT MAY BE SETTING AN OPEN DTC
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 3
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE PASSIVE ENTRY ANTENNA 3 HARNESS CONNECTOR AND VERIFY ABILITY OF THE RF HUB TO DETECT THE SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC

1. The Electronic Control Unit (ECU) harness connectors must be connected to the ECU during this test step.
2. With the ignition in the off position, disconnect the sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display the SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC with the connector disconnected?

Yes

- Replace the faulty sensor in accordance with the Service Information. Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .
-
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE PASSIVE ENTRY ANTENNA 3 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A73-12-PASSIVE ENTRY ANTENNA 3-CIRCUIT SHORT TO BATTERY

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When the Passive Entry Antenna 3 Signal Circuit is shorted to Battery.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT SHORTED TO VOLTAGE
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A73-13-PASSIVE ENTRY ANTENNA 3-CIRCUIT OPEN

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 3 Signal Circuit is open or shorted to the return circuit.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 3
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (D924) PASSIVE ENTRY ANTENNA 3 SIGNAL CIRCUIT FOR A SHORT TO THE (D925) PASSIVE ENTRY ANTENNA 3 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE PASSIVE ENTRY ANTENNA 3 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A74-01-PASSIVE ENTRY ANTENNA 4-GENERAL ELECTRICAL FAILURE

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- The Passive Entry Antenna 4 is faulty, out of range, calibration is incorrect, shorted or open.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT SHORTED TO VOLTAGE

Possible Causes
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 4
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.

4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

7. ISOLATE AND CHECK THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

8. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR A SHORT TO THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. REPLACE THE PASSIVE ENTRY ANTENNA 4 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [**ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION**](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .
- Test complete.

B1A74-11-PASSIVE ENTRY ANTENNA 4-CIRCUIT SHORT TO GROUND

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the

vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 4 Signal circuit is shorted to ground.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT SHORTED TO GROUND
PASSIVE ENTRY ANTENNA 4
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. DISCONNECT THE PASSIVE ENTRY ANTENNA 4 HARNESS CONNECTOR AND VERIFY ABILITY OF THE RF HUB TO DETECT THE SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC

1. The Electronic Control Unit (ECU) harness connectors must be connected to the ECU during this test step.
2. With the ignition in the off position, disconnect the sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display the SENSOR SIGNAL CIRCUIT OPEN/HIGH/SHORT TO VOLTAGE DTC with the connector disconnected?

Yes

- Replace the faulty sensor in accordance with the Service Information. Refer to [ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE PASSIVE ENTRY ANTENNA 4 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [**ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION**](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A74-12-PASSIVE ENTRY ANTENNA 4-CIRCUIT SHORT TO BATTERY

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When the Passive Entry Antenna 4 Signal Circuit is shorted to Battery.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT SHORTED TO VOLTAGE
PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT SHORTED TO VOLTAGE
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT FOR A SHORT TO VOLTAGE AT THE RF HUB HARNESS CONNECTOR

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. Press the ignition off.
2. Disconnect the RF HUB C2 harness connector.
3. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
5. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

1. Press the ignition on.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A74-13-PASSIVE ENTRY ANTENNA 4-CIRCUIT OPEN

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The RF Hub microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- Every Passive Entry or Keyless Go action.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- When Passive Entry Antenna 4 Signal Circuit is open or shorted to the return circuit.

DEFAULT ACTION

- Limitation of the Passive functionality (Keyless Go, Passive entry, etc.).
- EVIC message: "Service Keyless System".

POSSIBLE CAUSES

Possible Causes
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT OPEN
PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT SHORTED TO THE PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT
PASSIVE ENTRY ANTENNA 4

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the Key Fob to press the Start/Stop button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (D926) PASSIVE ENTRY ANTENNA 4 SIGNAL CIRCUIT FOR A SHORT TO THE (D927) PASSIVE ENTRY ANTENNA 4 RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. REPLACE THE PASSIVE ENTRY ANTENNA 4 AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [**ANTENNA, PASSIVE ENTRY, REMOVAL AND INSTALLATION**](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RFHM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .
- Test complete.

B1A76-11 - REMOTE START ANTENNA CIRCUIT- CIRCUIT SHORT TO GROUND

For a complete REMOTE START SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Remote start Antenna is an external UHF antenna which is always powered on and connected to the RF Hub. The range for Remote-Start function is at least 100 meters in all directions from the center of the vehicle while measured over an area of flat terrain with no obstructions.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- After the ignition leaves the Lock position.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- If the vehicle is configured to have Remote Start and the Radio Frequency Hub Module (RFHM) does not sense an antenna present, this code will set.

DEFAULT ACTION

- The Remote Start Range is Reduced or Remote Start may not operate.

POSSIBLE CAUSES

Possible Causes
REMOTE START ANTENNA
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK THE REMOTE START ANTENNA CONNECTION

1. Gain access to the Radio Frequency Hub Module (RFHM) connectors.
2. Disconnect and reconnect the Remote Start Antenna at the RFHM module.

NOTE: Confirm the connector is fully seated in the RFHM module.

3. Using the scan tool, record and erase the DTCs.
4. Press the ignition to the Lock position.
5. Start the engine and allow to run for 30 seconds.
6. Using the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE REMOTE START ANTENNA

1. Disconnect the Remote Start Antenna.
2. Replace the antenna with a known good antenna.
3. Press the ignition to the Lock position.
4. Start the engine and allow to run for 30 seconds.
5. Using the scan tool, read the active DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Remote Start Antenna in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RFHM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B1A76-13-REMOTE START ANTENNA CIRCUIT-CIRCUIT OPEN

For a complete REMOTE START SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Remote start Antenna is an external UHF antenna which is always powered on and connected to the RF Hub. The range for Remote-Start function is at least 100 meters in all directions from the center of the vehicle while measured over an area of flat terrain with no obstructions. The RF HUB monitors the RSA for an open circuit only.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The Bus is awake.
- After the ignition leaves the Lock position.
- Battery voltage between 10.0 - 16.0 volts.

SET CONDITION

- If the vehicle is configured to have Remote Start and the Radio Frequency Hub Module (RFHM) does not sense an antenna present, this code will set.

DEFAULT ACTION

- The Remote Start Range is Reduced or Remote Start may not operate.

POSSIBLE CAUSES

Possible Causes
REMOTE START ANTENNA DISCONNECTED
REMOTE START ANTENNA
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: Make sure all Remote Start Antenna (RSA) connections are connected properly.

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. CHECK THE REMOTE START ANTENNA

1. Disconnect the Remote Start Antenna.
2. Replace the antenna with a known good antenna.
3. With the scan tool, erase DTCS.
4. Press the ignition to the Lock position.
5. Start the engine and allow to run for 30 seconds.
6. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Remote Start Antenna in accordance with the Service Information.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .
- Test complete.

B1A7B-01-IMMOBILIZER ANTENNA (KIN/IGNM)-GENERAL ELECTRICAL FAILURE

THEORY OF OPERATION

The Radio Frequency Hub (RF-HUB) communicates with Keyless Ignition Node (KIN) through two redundant inputs, a hard wired ignition switch position signal and a dedicated Security K Line. The KIN has a built-in coil reader to read the Key Fob transponder in the event of a Key Fob battery failure or internal Key Fob failure.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- In all ignition positions and the Bus is awake.
- Whenever the Start Button is pressed for 2 seconds or the Loop test for the immobilizer is run.
- Battery voltage is between 6.0 - 16.0 volts.

SET CONDITION

- If the internal antenna is shorted to ground, open, shorted to battery or the internal terminals are shorted together, this code will set.

DEFAULT ACTION

- FOBIK functionality not available.

POSSIBLE CAUSES

Possible Causes
KEYLESS IGNITION NODE (KIN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. Press the Start button with the front of the FOBIK for 2 seconds, if the ignition status does not change to ACC, read DTCs.
4. Press the ignition on.
5. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Replace the Keyless Ignition Node (KIN) in accordance with Service Information. Refer to **MODULE, KEYLESS IGNITION NODE (KIN), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No - Single Occurrence

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

No - Multiple Occurrences

- Replace the Keyless Ignition Node (KIN) in accordance with Service Information. Refer to [MODULE, KEYLESS IGNITION NODE \(KIN\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B1A7D-01-START BUTTON-GENERAL ELECTRICAL FAILURE

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Radio Frequency Hub (RF-HUB) communicates with Keyless Ignition Node (KIN) through two redundant inputs, a hard wired ignition switch position signal and a dedicated Security K Line. The KIN has a built-in coil reader to read the Key Fob transponder in the event of a Key Fob battery failure or internal Key Fob failure.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- In all ignition positions and the Bus is active.
- Battery voltage is between 6.0 - 16.0 volts.
- Anytime the Start/Stop Button is pressed, the Radio Frequency Hub Module (RFHM) will check the Security K Line Communication circuit and the Start button debounced hardwired switch state signal circuit.

SET CONDITION

- If these two circuits do not match when the Start/Stop Button is pressed, this code will set.

DEFAULT ACTION

- Start/Stop button is inoperative.

POSSIBLE CAUSES

Possible Causes
SECURITY K LINE COMMUNICATION CIRCUIT OPEN
IGNITION SWITCH POSITION SIGNAL CIRCUIT SHORTED TO GROUND
IGNITION SWITCH POSITION SIGNAL CIRCUIT SHORTED TO BATTERY
KEYLESS IGNITION NODE (KIN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. ISOLATE AND CHECK THE (D122) SECURITY K LINE COMMUNICATION CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (G201) IGNITION SWITCH POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE (G201) IGNITION SWITCH POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. Press the ignition on.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. Connect the other lead of the DVOM to a known good ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no voltage on the circuit being tested.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Replace the Keyless Ignition Node (KIN) in accordance with the Service Information. Refer to [**MODULE, KEYLESS IGNITION NODE \(KIN\), REMOVAL AND**](#)

INSTALLATION

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST**.

B1A7D-2A-START BUTTON-STUCK

THEORY OF OPERATION

The Radio Frequency Hub (RF-HUB) communicates with Keyless Ignition Node (KIN) through two redundant inputs, a hard wired ignition switch position signal and a dedicated Security K Line. The KIN has a built-in coil reader to read the Key Fob transponder in the event of a Key Fob battery failure or internal Key Fob failure.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- In all ignition positions and the Bus is active.
- Battery voltage is between 6.0 - 16.0 volts.
- Each time the Start/Stop Button is pressed.

SET CONDITION

- If the Security K Line Communication circuit and the Ignition Switch Position Signal circuit match, during a button press, but are On for longer than 25 seconds, this DTC will set.

DEFAULT ACTION

- EVIC message: "Service Keyless System".
- Start/Stop button is inoperative.

POSSIBLE CAUSES

Possible Causes
FOREIGN OBJECT STUCK IN SWITCH KEYLESS IGNITION NODE (KIN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. EXAMINE THE KEYLESS IGNITION NODE (KIN)

1. Check for anything that could cause the button to stick.

Could you find anything that would cause a sticking condition?

Yes

- Repair as necessary.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Replace the Keyless Ignition Node (KIN) in accordance with the Service Information. Refer to [MODULE, KEYLESS IGNITION NODE \(KIN\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

B215B-12-IGNITION RUN/START 2 CONTROL-CIRCUIT SHORT TO BATTERY

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition in the OFF, LOCK or ACCESSORY position.
- Battery voltage is between 6.0 - 16.0 volts.
- During a Passive Entry or Keyless Go event.

SET CONDITION

- Whenever the Radio Frequency Hub Module (RFHM) senses a short to battery on the Ignition Run/Start Control Output circuit.

DEFAULT ACTION

- EVIC message "Service Keyless System".
- Vehicle may not turn off.

POSSIBLE CAUSES

Possible Causes
IGNITION RUN/START OUTPUT CIRCUIT SHORTED TO VOLTAGE
RADIO FREQUENCY HUB MODULE (RF HUB)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

2. CHECK THE (F20) IGNITION RUN/START OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE

1. Press the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: There should be no voltage on the (F20) Ignition Run/Start Output circuit with the ignition in the off position.

Is there any voltage on the circuit being tested?

Yes

- Repair the short to voltage on the circuit tested. Use the wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .
- Test complete.

B215B-14-IGNITION RUN/START 2 CONTROL-CIRCUIT SHORT TO GROUND OR OPEN

For a complete STARTING SYSTEM wiring diagram, Refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition in the RUN or Start position.
- Battery voltage is between 6.0 - 16.0 volts.
- During a Passive Entry or Keyless Go event.

SET CONDITION

- Whenever the Radio Frequency Hub (RFHM) Module detects an open, or a short to ground on the Ignition Run/Start Control Output circuit.

DEFAULT ACTION

- Vehicle may not crank.

POSSIBLE CAUSES

Possible Causes
IGNITION RUN/START OUTPUT CIRCUIT SHORTED TO GROUND
IGNITION RUN/START OUTPUT CIRCUIT OPEN
RADIO FREQUENCY HUB MODULE (RF HUB)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**STANDARD PROCEDURE**](#).

2. ISOLATE AND CHECK THE (F20) IGNITION RUN/START OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#).

3. ISOLATE AND CHECK THE (F20) IGNITION RUN/START OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions and module is awake.
- Battery voltage must be at least 7.5 volts but no higher than 10.0 volts.

SET CONDITION

- Anytime the Radio Frequency Hub Module (RFHM) detects voltage input below 10.0 volts for over 15 seconds.

DEFAULT ACTION

- Some functionality of the RFHM is lost below 10V.
- Passive Entry and Keyless Go functions will not be triggered below 9.0 volts.
- Entry into the vehicle can be achieved with RKE portion of the FOB/K or the backup key blade.
- Starting can be achieved by pressing the Stop/Start Button with the rounded end of the FOB/K.

POSSIBLE CAUSES

Possible Causes
LOW VOLTAGE ENGINE DTC FUSED B(+) CIRCUIT HAS HIGH RESISTANCE GROUND CIRCUIT HAS HIGH RESISTANCE RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK POWERTRAIN DTCs

NOTE: Verify that the battery is fully charged with a DVOM and use the scan tool to compare the Battery Voltage listed under "Data" in the RFH View to that of the BCM. If the battery is not fully charged, correct this condition before proceeding.

1. With the scan tool, read the active PCM DTCs.

Are there any Battery or Charging System DTCs?

Yes

- Refer to and perform the appropriate diagnostic procedure for the charging system DTCs.

No

- Go To [2](#)

2. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press

the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#).

3. CHECK THE (A230) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

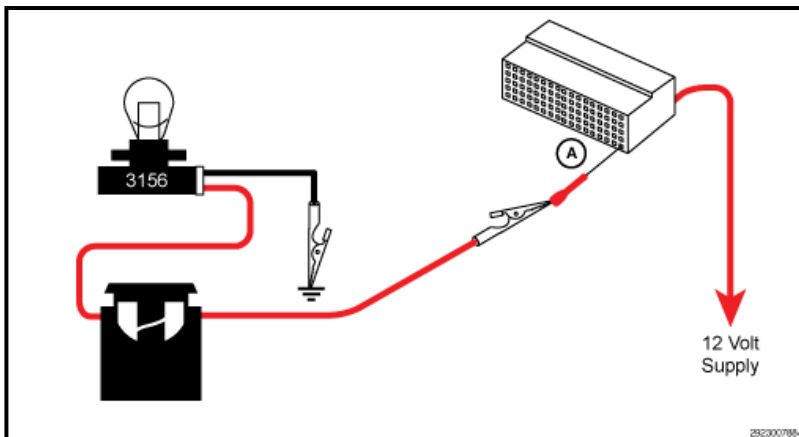
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

**NOTE:**

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

4. CHECK THE (Z915) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.

3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

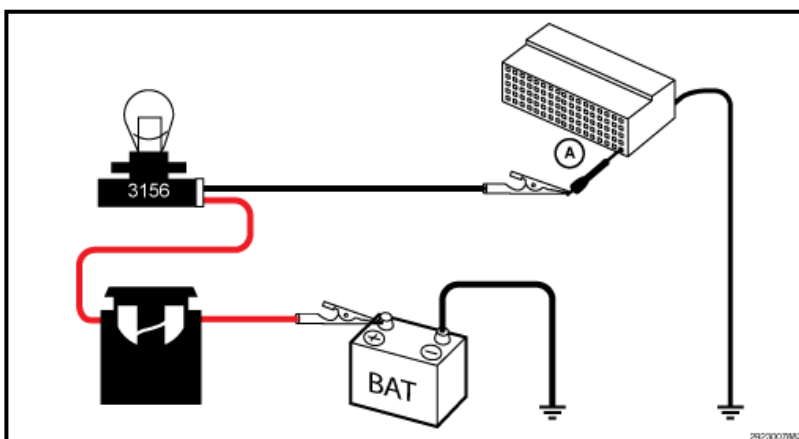
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RFHM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions and module is awake.
- Battery voltage must be at least 16.0 volts but no higher than 20.0 volts for this fault to set.

SET CONDITION

- Anytime the Radio Frequency Hub Module (RFHM) detects voltage input above 16.0 volts.

DEFAULT ACTION

- Some functionality of the RFHM is lost above 16.0 volts.
- Passive Entry and Keyless Go functions will not be triggered above 16.0 volts.
- Entry into the vehicle can be achieved with RKE portion of the FOB/K or the backup key blade.
- Starting can be achieved by pressing the Stop/Start Button with the rounded end of the FOB/K.

POSSIBLE CAUSES

Possible Causes
HIGH VOLTAGE PCM DTC
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE CHARGING DTC

1. Verify that the battery is not overcharged with a DVOM.
2. With the scan tool, compare the Battery Voltage listed under "Data" in the RFH View to that of the PCM. If the battery is overcharged, correct this condition before proceeding.
3. With the scan tool, read PCM DTCs and record on the repair order.

Are there any active Battery or Charging system DTCs present?

Yes

- Repair PCM DTC(s) in accordance with Service Information. Refer to the appropriate service information .

No

- Go To [2](#)

2. CHECK THE RF HUB

1. With the scan tool, read Radio Frequency Hub Module (RF HUB) DTCs and record on the repair order.
2. Start the engine and run for two minutes.
3. With the scan tool, read RF HUB DTCs.

Is the DTC active?

Yes

- Replace the Radio Frequency Hub (RFHM) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the run position.
- The Bus is awake
- Battery voltage is between 10.0 - 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) sends a message that the system voltage is below 10.0 volts.

DEFAULT ACTION

- Some Radio Frequency Hub Module (RFHM) functionality is lost.

POSSIBLE CAUSES

Possible Causes
LOW SYSTEM VOLTAGE BATTERY OR CHARGING SYSTEM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. With the scan tool, create a Vehicle Scan Report and attach it to the repair order.
2. With the scan tool, read BCM DTCs.

Are there any BCM Charging or Battery DTCs present?

Yes

- Refer to **DIAGNOSIS AND TESTING** and perform the appropriate diagnostic procedure.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
- This code is for information only. At some time there was low battery system voltage. Check the battery and charging system in accordance with the Service Information.

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is in the run position.
- The Bus is awake.
- Battery voltage is between 10.0 - 16.0 volts.

SET CONDITION

- When the Body Control Module (BCM) sends a message that the system voltage is above 16.0 volts.

DEFAULT ACTION

- Some Radio Frequency Hub Module (RFHM) Module functionality is lost.

POSSIBLE CAUSES

Possible Causes
HIGH SYSTEM VOLTAGE BATTERY OR CHARGING SYSTEM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. With the scan tool, create a Vehicle Scan Report and attach it to the repair order.
2. With the scan tool, read BCM DTCs.

Are there any BCM Charging or Battery DTCs present?

Yes

- Refer to **DIAGNOSIS AND TESTING** and perform the appropriate diagnostic procedure.

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
- This code is for information only. At some time there was high battery system voltage. Check the battery and charging system in accordance with the Service Information.

B2205-00-ORIGINAL VIN MISSING / MISMATCH

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- The ignition is on.
- The Bus is awake.
- Battery voltage is between 10.0 - 16.0 volts

SET CONDITION

- The Radio Frequency Hub Module (RFHM) will receive and monitor the VIN message from the PCM and record the VIN if different from the last VIN.

DEFAULT ACTION

- Engine may crank but will not continue to run for more than a few seconds.

POSSIBLE CAUSES

Possible Causes
RADIO FREQUENCY HUB MODULE (RFHM) RECEIVED INVALID VIN
RADIO FREQUENCY HUB MODULE (RFHM) NOT PROGRAMMED
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [STANDARD PROCEDURE](#) .

2. CHECK THE VEHICLE VIN

1. Press the ignition on.
2. With the scan tool, select: Radio Frequency Hub Module (RF HUB)
3. Locate the "VIN Original" and compare it to the actual vehicle VIN.

Does the RFHM "Vin Original" match the vehicle VIN?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Go To [3](#)

3. RESET THE RF HUB

1. With the scan tool, select "Misc Functions".
2. With the scan tool, perform the "Reset ECU" routine.
3. Press the ignition off.
4. Try to start the engine three times.

Did the engine start?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

No

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- In all ignition modes.

SET CONDITION

- When the Radio Frequency Hub Module (RFHM) has not learned proper configuration at least once. This can take place at end of the assembly line or at dealership when the RFHM is replaced and the configuration is not performed or not accepted.

DEFAULT ACTION

- Various RFHM outputs are not operational.

POSSIBLE CAUSES

Possible Causes
CONFIGURATION NOT PERFORMED ON THE RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. PROGRAM THE RF HUB MODULE

1. With the scan tool, reprogram and configure the RF-Hub Module in accordance with Service Information.
2. With the scan tool, record and erase the RF-Hub Module DTCs.

3. Press the ignition switch from on to off, wait five seconds and then back to on.
4. With the scan tool, read the active RF HUB DTCs.

Did the DTC return?

Yes

- Replace the RF-Hub Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B22A0-49-RF HUB-INTERNAL ELECTRONIC FAILURE

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- All ignition positions.
- The bus is awake.
- Battery voltage is between 10.0 - 16.0 volts.

SET CONDITION

- Whenever the module detects an EEPROM failure.

DEFAULT ACTION

- Loss of some or all Radio Frequency Hub Module (RFHM) operation.

POSSIBLE CAUSES

Possible Causes
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.

4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **STANDARD PROCEDURE** .

2. REPLACE THE RADIO FREQUENCY MODULE

Repair

- Replace the Radio Frequency Hub (RF HUB) Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
 - Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .
-

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Radio Frequency Module (RF HUB) - DTCS B22A9-00 To U1517-87 - Gladiator

DTC TROUBLESHOOTING

B22A9-00-ECU INTERNAL PERFORMANCE

WHEN MONITORED

SET CONDITION

- When the Radio Frequency Hub Module (RFHM) detects an internal problem.

DEFAULT ACTION

- Limited Passive Entry functionality or no power operation.

POSSIBLE CAUSES

Possible Causes
OTHER DTCS SET IN THIS MODULE RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR RELATED DTCS

NOTE: Verify that the battery is fully charged with a DVOM and use the scan tool to compare the Battery Voltage listed under "Data" in the RFH View to that of the BCM. If the battery is not fully charged, correct this condition before proceeding.

1. With the scan tool, read the RFHM DTCs.

Does the scan tool display any passive entry antenna, battery voltage, or system voltage DTCs?

Yes

- Diagnose and repair the other DTCs in this module before proceeding.

No

- Go To [3](#)

3. RADIO FREQUENCY HUB MODULE

Is the DTC active?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#).
- Perform the RADIO FREQUENCY HUB (RFHM) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

B259A-11-FRONT LEFT DOOR HANDLE SENSE-CIRCUIT SHORT TO GROUND

For a complete PASSIVE ENTRY SYSTEM wiring diagram, Refer to the appropriate wiring information .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The Radio Frequency Hub Module (RFHM) microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The three switches of each Passive Entry (PE) outside door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFHM on a signal circuit, and a clean ground from the RFHM on a return circuit. The PE handle IC and the RFHM communicate with each other by modulating the current in the signal circuit.

Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFHM up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFHM determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected Key Fob.

The tactile, mechanical, resistive membrane lock switch allows the user to actively lock the vehicle. The capacitive switch senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch senses handle pull movement. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR DOOR HANDLE END CAP MAGNET VERIFICATION TEST



NOTE: To verify that the Exterior Door Handle End Cap Magnet is installed in the Handle End Cap, remove the Exterior Door Handle End Cap, use a metal paper clip and see if the paper clip will magnetically attach onto the inside of the Exterior Handle End Cap as shown above.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions.
- During the Passive Entry or Keyless Go event.
- Battery voltage is between 10.0 - 16.0 volts.
- Smart sensor (magnet) is present in the Door Handle cap.

SET CONDITION

- When the RFHM module detects a short to ground after 1 minute during an ignition cycle.

- When the RFHM module detects an open or short to ground condition within an ignition cycle.

DEFAULT ACTION

- EVIC message" Service Keyless System".
- Must use RKE or bladed key to enter the vehicle.

POSSIBLE CAUSES

Possible Causes
INCORRECT EXTERIOR DOOR HANDLE END CAP/MISSING MAGNET INSIDE OF HANDLE END CAP
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT SHORTED TO GROUND
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH RETURN CIRCUIT OPEN
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT OPEN
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT SHORTED TO THE DRIVER PASSIVE ENTRY HANDLE SWITCH RETURN CIRCUIT
FRONT LEFT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR A SMART DOOR HANDLE

1. Verify that the smart sensor (magnet) is present by removing the Door Handle End Cap and visually looking for a smart sensor (magnet) in the side of the door handle cap closest to the handle.

Is the smart sensor (magnet) in the door handle cap?

Yes

- Go To [3](#)

No

- Replace the Front Left Exterior Door Handle Cap in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR AN ACTIVE DTC

1. The battery should be at full charge before proceeding.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. With the scan tool, select: "RFH" and "System" Tests.
4. Perform the Door Handle Verification Test. This will activate the Module to retest for DTCs.
5. With the scan tool, read RFHM DTCs and wait one (1) minute.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

4. CHECK THE (P125) FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT

1. With the scan tool, select "RFH", "Data" and scroll to "FRONT LEFT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [5](#)

ON

- Go To [10](#)

5. CHECK THE (P125) FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT FOR AN OPEN OR SHORT

1. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
2. With the scan tool, select "RFH", "Data" and scroll to "FRONT LEFT Door Handle Power".
3. Double click on the Value field to start the graph.
4. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. CHECK THE FRONT LEFT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)

1. Remove the FRONT LEFT Exterior Door Handle and disconnect the switch harness connector.
2. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
3. With the scan tool, select "RFH", "Data" and scroll to "FRONT LEFT Door Handle Power".
4. Double click on the Value field to start the graph.
5. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [7](#)

No

- Replace the FRONT LEFT External Door Handle. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (P125) FRONT LEFT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [8](#)

8. ISOLATE AND CHECK THE (P125) FRONT LEFT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR A SHORT TO THE (P124) FRONT LEFT PASSIVE HANDLE SWITCH RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [17](#)

9. CHECK THE (P125) FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT

1. Continue with the scan tool still on "FRONT LEFT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [17](#)

ON

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

10. CHECK THE FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE OR RETURN CIRCUIT FOR AN OPEN

1. Continue with the scan tool still on "FRONT LEFT Door Handle Power".
2. Double click on the Value field to start the graph.
3. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [11](#)

11. CHECK THE FRONT LEFT DOOR HANDLE FUNCTIONS

1. Stop the graph.
2. Lower the FRONT LEFT door window.
3. Press the ignition off, remove the FOBIK and close all doors.
4. With the scan tool, select "RFH", "Data" and scroll to "Last Passive Entry Function Completed".
5. Have the FOBIK outside the vehicle and within 1.5 m (5 ft.) of the FRONT LEFT door handle.
6. In the next steps, wait two (2) seconds between each Lock and Unlock activation as there is a two second delay after each Lock action.
7. Press the Lock button and observe the screen for "Passive lock at FRONT LEFT door".
8. Grab and lift the door handle and observe the screen for "Passive entry at FRONT LEFT door".
9. Repeat steps 6 and 7 two more times.

Is the Module receiving the inputs on the screen as you do them?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

No

- Go To [12](#)

12. CHECK THE FRONT LEFT DOOR HANDLE CIRCUITS

1. Remove the FRONT LEFT Exterior Door Handle and disconnect the switch harness connector.
2. Measure the voltage between the (P124) FRONT LEFT Passive Handle Switch Return and the (P125) FRONT LEFT Passive Handle Sense circuits in the FRONT LEFT Exterior Door Handle Switch connector.

Is the voltage above 11.8 volts?

Yes

- Replace the FRONT LEFT External Door Handle in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [13](#)

13. CHECK THE (P124) FRONT LEFT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR CONTINUITY

1. Check for continuity between ground and the (P124) Front Left Passive Handle Switch Return circuit at the Front Left Exterior Door Handle Switch harness connector.

Is there continuity between ground and the (P124) Front Left Passive Handle Switch Return circuit?

Yes

- Go To [16](#)

No

- Go To [14](#)

14. ISOLATE AND CHECK THE (P124) FRONT LEFT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [15](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

15. CHECK THE (Z915) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps)

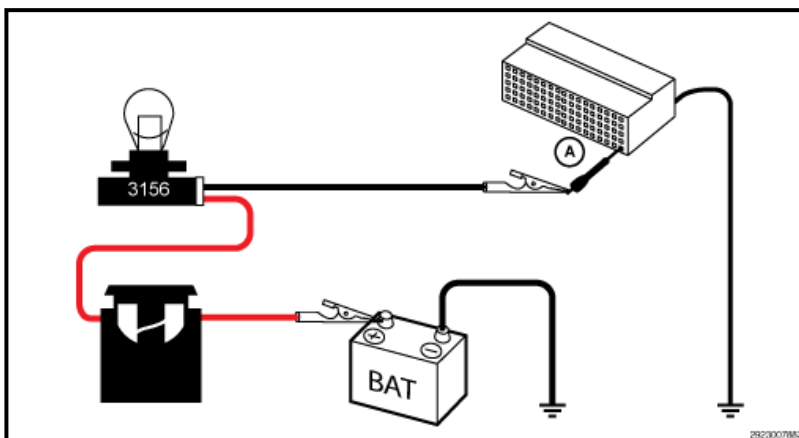
and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [17](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB MODULE (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

16. ISOLATE AND CHECK THE (P125) FRONT LEFT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [17](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

17. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB MODULE (RF HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB MODULE (RF HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B259A-13-FRONT LEFT DOOR HANDLE SENSE-CIRCUIT OPEN

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The Radio Frequency Hub Module (RFHM) microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The three switches of each Passive Entry (PE) outside door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFHM on a signal circuit, and a clean ground from the RFHM on a return circuit. The PE handle IC and the RFHM communicate with each other by modulating the current in the signal circuit.

Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFHM up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFHM determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected Key Fob.

The tactile, mechanical, resistive membrane lock switch allows the user to actively lock the vehicle. The capacitive switch senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch senses handle pull movement. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR DOOR HANDLE END CAP MAGNET VERIFICATION TEST



NOTE: To verify that the Exterior Door Handle End Cap Magnet is installed in the Handle End Cap, remove the Exterior Door Handle End Cap, use a metal paper clip and see if the paper clip will magnetically attach onto the inside of the Exterior Handle End Cap as shown above.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions.
- During the Passive Entry or Keyless Go event.
- Battery voltage is between 10.0 - 16.0 volts.
- Smart sensor (magnet) is present in the Door Handle cap.

SET CONDITION

- When the RFHM module detects an open or short to battery condition after 3 consecutive resets within an ignition cycle.

DEFAULT ACTION

- EVIC message" Service Keyless System".
- Must use RKE or bladed key to enter the vehicle.

POSSIBLE CAUSES

Possible Causes
INCORRECT EXTERIOR DOOR HANDLE END CAP/MISSING MAGNET INSIDE OF HANDLE END CAP
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH RETURN CIRCUIT OPEN
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT SHORTED TO BATTERY
FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT OPEN
FRONT LEFT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR A SMART DOOR HANDLE

1. Verify that the smart sensor (magnet) is present by removing the Door Handle End Cap and visually looking for a smart sensor (magnet) in the side of the door handle cap closest to the handle.

Is the smart sensor (magnet) in the door handle cap?

Yes

- Go To [3](#)

No

- Replace the Front Left Exterior Door Handle Cap in accordance with the Service Information. Refer to [**HANDLE, EXTERIOR, REMOVAL AND INSTALLATION**](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. CHECK FOR AN ACTIVE DTC

1. The battery should be at full charge before proceeding.
2. With the scan tool, read RF Hub DTCs and record on the repair order.
3. With the scan tool, select: "RFH" and "System" Tests.
4. Perform the Door Handle Verification Test. This will activate the Module to retest for DTCs.
5. With the scan tool, read RF Hub DTCs and wait one (1) minute.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

4. CHECK THE FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE

1. With the scan tool, select "RFH", "Data" and scroll to "FRONT LEFT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [5](#)

ON

- Go To [8](#)

5. CHECK THE FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE VALUE

1. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
2. With the scan tool, select "RFH", "Data" and scroll to "FRONT LEFT Door Handle Power".
3. Double click on the Value field to start the graph.
4. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [7](#)

6. CHECK THE FRONT LEFT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)

1. Remove the FRONT LEFT Exterior Door Handle and disconnect the switch harness connector.

2. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
3. With the scan tool, select "RFH", "Data" and scroll to "FRONT LEFT Door Handle Power".
4. Double click on the Value field to start the graph.
5. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [7](#)

No

- Replace the Front Left Exterior Door Handle Cap in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK THE (P125) FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT

1. Continue with the scan tool still on "FRONT LEFT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [16](#)

ON

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

8. CHECK THE FRONT LEFT PASSIVE ENTRY HANDLE SWITCH SENSE AND RETURN CIRCUITS FOR AN OPEN

1. Continue with the scan tool still on "FRONT LEFT Door Handle Power".
2. Double click on the Value field to start the graph.
3. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [9](#)

9. CHECK THE FRONT LEFT DOOR HANDLE FUNCTIONS

1. Stop the graph.
2. Lower the FRONT LEFT door window.
3. Turn the ignition off, remove the FOB/K and close all doors.
4. With the scan tool, select "RFH", "Data" and scroll to "Last Passive Entry Function Completed".
5. Have the FOB/K outside the vehicle and within 1.5 m (5 ft.) of the FRONT LEFT door handle.

NOTE: In the next steps, wait two (2) seconds between each Lock and Unlock activation as there is a two second delay after each Lock action.

6. Press the Lock button and observe the screen for "Passive lock at FRONT LEFT door".
7. Grab and lift the door handle and observe the screen for "Passive entry at FRONT LEFT door".
8. Repeat steps 6 and 7 two more times.

Is the Module receiving the inputs on the screen as you do them?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

No

- Go To [10](#)

10. CHECK THE FRONT LEFT DOOR HANDLE CIRCUITS

1. Remove the FRONT LEFT Exterior Door Handle and disconnect the switch harness connector.
2. Measure the voltage between the (P124) Front Left Passive Handle Switch Return and the (P125) Front Left Passive Handle Sense circuits in the Front Left Exterior Door Handle Switch connector.

Is the voltage above 11.8 volts?

Yes

- Replace the Front Left External Door Handle in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [11](#)

11. CHECK THE (P124) FRONT LEFT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR CONTINUITY

1. Check for continuity between ground and the (P124) Front Left Passive Handle Switch Return circuit at the Front Left Exterior Door Handle Switch harness connector.

Is there continuity between ground and the (P124) Front Left Passive Handle Switch Return circuit?

Yes

- Go To [14](#)

No

- Go To [12](#)

12. ISOLATE AND CHECK THE (P124) FRONT LEFT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow

the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [13](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

13. CHECK THE (Z915) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

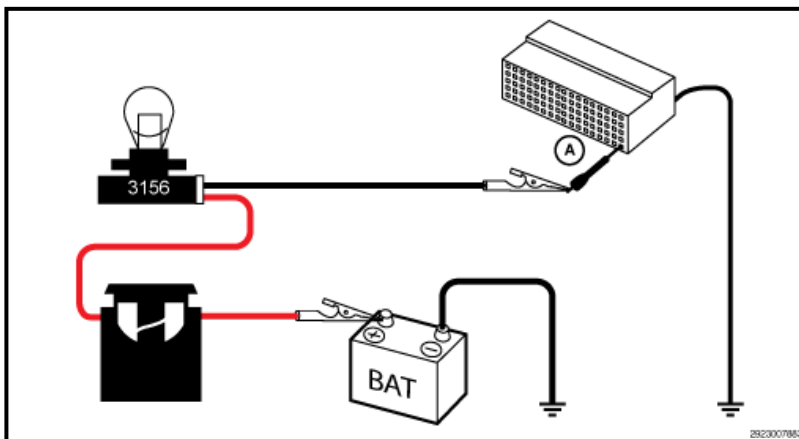
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.

- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [16](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

14. ISOLATE AND CHECK THE (P125) FRONT LEFT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [15](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

15. CHECK THE (P125) FRONT LEFT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Measure the voltage between ground and the (P125) Front Left Passive Handle Switch Sense circuit at the RF Hub Module C2 harness connector.

Is there any voltage present?

Yes

- Repair the (P125) Front Left Passive Handle Sense circuit for a short to voltage.
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

No

- Go To [16](#)

16. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B259B-11-FRONT RIGHT DOOR HANDLE SENSE-CIRCUIT SHORT TO GROUND

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The Radio Frequency Hub Module (RFHM) microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The three switches of each Passive Entry (PE) outside door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFHM on a signal circuit, and a clean ground from the RFHM on a return circuit. The PE handle IC and the RFHM communicate with each other by modulating the current in the signal circuit.

Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFHM up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFHM determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected Key Fob.

The tactile, mechanical, resistive membrane lock switch allows the user to actively lock the vehicle. The capacitive switch senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch senses handle pull movement. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR DOOR HANDLE END CAP MAGNET VERIFICATION TEST



NOTE: To verify that the Exterior Door Handle End Cap Magnet is installed in the Handle End Cap, remove the Exterior Door Handle End Cap, use a metal paper clip and see if the paper clip will magnetically attach onto the inside of the Exterior Handle End Cap as shown above.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions.
- During the Passive Entry or Keyless Go event.
- Battery voltage is between 10.0 - 16.0 volts.
- Smart sensor (magnet) is present in the Door Handle cap.

SET CONDITION

- When the RFHM module detects a short to ground after 1 minute during an ignition cycle.
- When the RFHM module detects an open or short to ground condition within an ignition cycle.

DEFAULT ACTION

- EVIC message" Service Keyless System".
- Must use RKE or bladed key to enter the vehicle.

POSSIBLE CAUSES

Possible Causes
INCORRECT EXTERIOR DOOR HANDLE END CAP/MISSING MAGNET INSIDE OF HANDLE END CAP
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT SHORTED TO GROUND
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH RETURN CIRCUIT OPEN
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT OPEN
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT SHORTED TO THE PASSIVE ENTRY HANDLE SWITCH RETURN CIRCUIT
FRONT RIGHT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOB/K to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR A SMART DOOR HANDLE

1. Verify that the smart sensor (magnet) is present by removing the Door Handle End Cap and visually looking for a smart sensor (magnet) in the side of the door handle cap closest to the handle.

Is the smart sensor (magnet) in the door handle cap?

Yes

- Go To [3](#)

No

- Replace the Front Right Exterior Door Handle Cap in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK FOR AN ACTIVE DTC

1. The battery should be at full charge before proceeding.
2. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
3. With the scan tool, select: "RFH" and "System" Tests.
4. Perform the Door Handle Verification Test. This will activate the Module to retest for DTCs.
5. With the scan tool, read RFHM DTCs and wait one (1) minute.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

4. CHECK THE (P400) FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT

1. With the scan tool, select "RFH", "Data" and scroll to "FRONT RIGHT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [5](#)

ON

- Go To [10](#)

5. CHECK THE (P400) FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT FOR AN OPEN OR SHORT

1. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
2. With the scan tool, select "RFH", "Data" and scroll to "FRONT RIGHT Door Handle Power".
3. Double click on the Value field to start the graph.
4. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. CHECK THE FRONT RIGHT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)

1. Remove the FRONT RIGHT Exterior Door Handle and disconnect the switch harness connector.
2. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
3. With the scan tool, select "RFH", "Data" and scroll to "FRONT RIGHT Door Handle Power".
4. Double click on the Value field to start the graph.
5. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [7](#)

No

- Replace the FRONT RIGHT External Door Handle. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (P400) FRONT RIGHT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [8](#)

8. ISOLATE AND CHECK THE (P400) FRONT RIGHT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR A SHORT TO THE (P401) FRONT RIGHT PASSIVE HANDLE SWITCH RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

No

- Go To [17](#)

9. CHECK THE (P400) FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT

1. Continue with the scan tool still on "FRONT RIGHT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [17](#)

ON

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

10. CHECK THE FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE OR RETURN CIRCUIT FOR AN OPEN

1. Continue with the scan tool still on "FRONT RIGHT Door Handle Power".
2. Double click on the Value field to start the graph.
3. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [11](#)

11. CHECK THE FRONT RIGHT DOOR HANDLE FUNCTIONS

1. Stop the graph.
2. Lower the FRONT RIGHT door window.
3. Press the ignition off, remove the FOB/K and close all doors.
4. With the scan tool, select "RFH", "Data" and scroll to "Last Passive Entry Function Completed".
5. Have the FOB/K outside the vehicle and within 1.5 m (5 ft.) of the FRONT RIGHT door handle.

NOTE: In the next steps, wait two (2) seconds between each Lock and Unlock activation as there is a two second delay after each Lock action.

6. Press the Lock button and observe the screen for "Passive lock at FRONT RIGHT door".
7. Grab and lift the door handle and observe the screen for "Passive entry at FRONT RIGHT door".
8. Repeat steps 6 and 7 two more times.

Is the Module receiving the inputs on the screen as you do them?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

No

- Go To [12](#)

12. CHECK THE FRONT RIGHT DOOR HANDLE CIRCUITS

1. Remove the FRONT RIGHT Exterior Door Handle and disconnect the switch harness connector.
2. Measure the voltage between the (P401) FRONT RIGHT Passive Handle Switch Return and the (P400) FRONT RIGHT Passive Handle Sense circuits in the FRONT RIGHT Exterior Door Handle Switch connector.

Is the voltage above 11.8 volts?

Yes

- Replace the FRONT RIGHT External Door Handle in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#).
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [13](#)

13. CHECK THE (P401) FRONT RIGHT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR CONTINUITY

1. Check for continuity between ground and the (P401) Front Right Passive Handle Switch Return circuit at the Front Right Exterior Door Handle Switch harness connector.

Is there continuity between ground and the (P401) Front Right Passive Handle Switch Return circuit?

Yes

- Go To [16](#)

No

- Go To [14](#)

14. ISOLATE AND CHECK THE (P401) FRONT RIGHT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [15](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

15. CHECK THE (Z915) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps)

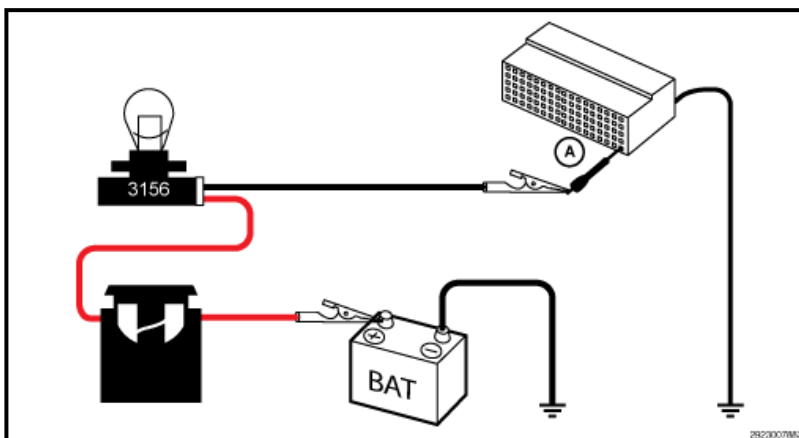
and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [17](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB MODULE (RFHM) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

16. ISOLATE AND CHECK THE (P400) FRONT RIGHT PASSIVE HANDLE SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [17](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

17. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB MODULE (RF HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB MODULE (RF HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B259B-13-FRONT RIGHT DOOR HANDLE SENSE-CIRCUIT OPEN

For a complete PASSIVE ENTRY SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The Radio Frequency Hub Module (RFHM) microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The three switches of each Passive Entry (PE) outside door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFHM on a signal circuit, and a clean ground from the RFHM on a return circuit. The PE handle IC and the RFHM communicate with each other by modulating the current in the signal circuit.

Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFHM up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFHM determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected Key Fob.

The tactile, mechanical, resistive membrane lock switch allows the user to actively lock the vehicle. The capacitive switch senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch senses handle pull movement. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR DOOR HANDLE END CAP MAGNET VERIFICATION TEST



NOTE: To verify that the Exterior Door Handle End Cap Magnet is installed in the Handle End Cap, remove the Exterior Door Handle End Cap, use a metal paper clip and see if the paper clip will magnetically attach onto the inside of the Exterior Handle End Cap as shown above.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions.
- During the Passive Entry or Keyless Go event.
- Battery voltage is between 10.0 - 16.0 volts.
- Smart sensor (magnet) is present in the Door Handle cap.

SET CONDITION

- When the RFHM module detects an open or short to battery condition after 3 consecutive resets within an ignition cycle.

DEFAULT ACTION

- EVIC message" Service Keyless System".
- Must use RKE or bladed key to enter the vehicle.

POSSIBLE CAUSES

Possible Causes
INCORRECT EXTERIOR DOOR HANDLE END CAP/MISSING MAGNET INSIDE OF HANDLE END CAP
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH RETURN CIRCUIT OPEN
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT SHORTED TO BATTERY
FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT OPEN
FRONT RIGHT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: To Press the ignition on the Passive Entry Keyless Go (PEKG)/Keyless Ignition Node (KIN) system, use the rounded end of the FOBIK to press the Stop/Start button.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR A SMART DOOR HANDLE

1. Verify that the smart sensor (magnet) is present by removing the Door Handle End Cap and visually looking for a smart sensor (magnet) in the side of the door handle cap closest to the handle.

Is the smart sensor (magnet) in the door handle cap?

Yes

- Go To [3](#)

No

- Replace the Front Right Exterior Door Handle Cap in accordance with the Service Information. Refer to [**HANDLE, EXTERIOR, REMOVAL AND INSTALLATION**](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

3. CHECK FOR AN ACTIVE DTC

1. The battery should be at full charge before proceeding.
2. With the scan tool, read RF Hub DTCs and record on the repair order.
3. With the scan tool, select: "RFH" and "System" Tests.
4. Perform the Door Handle Verification Test. This will activate the Module to retest for DTCs.
5. With the scan tool, read RF Hub DTCs and wait one (1) minute.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

4. CHECK THE FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE

1. With the scan tool, select "RFH", "Data" and scroll to "FRONT RIGHT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [5](#)

ON

- Go To [8](#)

5. CHECK THE FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE VALUE

1. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
2. With the scan tool, select "RFH", "Data" and scroll to "FRONT RIGHT Door Handle Power".
3. Double click on the Value field to start the graph.
4. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [7](#)

6. CHECK THE FRONT RIGHT EXTERIOR DOOR HANDLE (PASSIVE ENTRY)

1. Remove the FRONT RIGHT Exterior Door Handle and disconnect the switch harness connector.

2. With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
3. With the scan tool, select "RFH", "Data" and scroll to "FRONT RIGHT Door Handle Power".
4. Double click on the Value field to start the graph.
5. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [7](#)

No

- Replace the Front Right Exterior Door Handle Cap in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CHECK THE (P400) FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT

1. Continue with the scan tool still on "FRONT RIGHT Door Handle Power".
2. Observe the Value field.

What does the Value field display?

OFF

- Go To [16](#)

ON

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

8. CHECK THE FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE AND RETURN CIRCUITS FOR AN OPEN

1. Continue with the scan tool still on "FRONT RIGHT Door Handle Power".
2. Double click on the Value field to start the graph.
3. Observe the graph for a pulsating line.

Is the graph pulsating between high and low on the screen?

Yes

- Go To [6](#)

No

- Go To [9](#)

9. CHECK THE FRONT RIGHT DOOR HANDLE FUNCTIONS

1. Stop the graph.
2. Lower the FRONT RIGHT door window.
3. Turn the ignition off, remove the FOB/K and close all doors.
4. With the scan tool, select "RFH", "Data" and scroll to "Last Passive Entry Function Completed".
5. Have the FOB/K outside the vehicle and within 1.5 m (5 ft.) of the FRONT RIGHT door handle.

6. In the next steps, wait two (2) seconds between each Lock and Unlock activation as there is a two second delay after each Lock action.
7. Press the Lock button and observe the screen for "Passive lock at FRONT RIGHT door".
8. Grab and lift the door handle and observe the screen for "Passive entry at FRONT RIGHT door".
9. Repeat steps 6 and 7 two more times.

Is the Module receiving the inputs on the screen as you do them?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

No

- Go To [10](#)

10. CHECK THE FRONT RIGHT DOOR HANDLE CIRCUITS

1. Remove the FRONT RIGHT Exterior Door Handle and disconnect the switch harness connector.
2. Measure the voltage between the (P401) Front Right Passive Handle Switch Return and the (P400) Front Right Passive Handle Sense circuits in the Front Right Exterior Door Handle Switch connector.

Is the voltage above 11.8 volts?

Yes

- Replace the Front Right External Door Handle in accordance with the Service Information. Refer to **HANDLE, EXTERIOR, REMOVAL AND INSTALLATION** .
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [11](#)

11. CHECK THE (P401) FRONT RIGHT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR CONTINUITY

1. Check for continuity between ground and the (P401) Front Right Passive Handle Switch Return circuit at the Front Right Exterior Door Handle Switch harness connector.

Is there continuity between ground and the (P401) Front Right Passive Handle Switch Return circuit?

Yes

- Go To [14](#)

No

- Go To [12](#)

12. ISOLATE AND CHECK THE (P401) FRONT RIGHT PASSIVE HANDLE SWITCH RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [13](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

13. CHECK THE (Z915) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

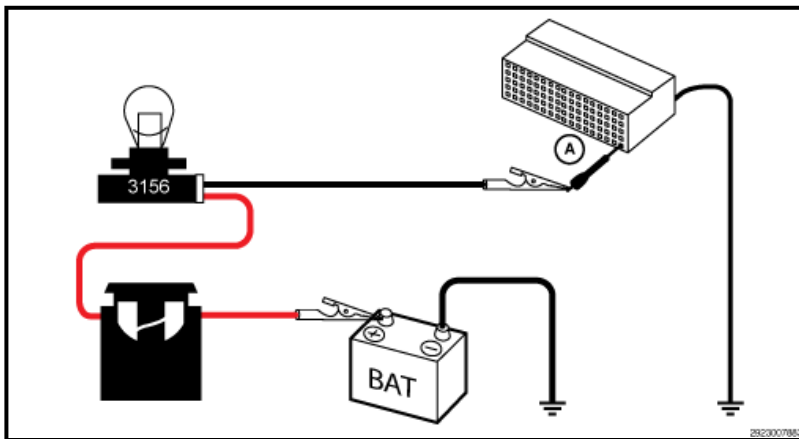
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.

- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [16](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

14. ISOLATE AND CHECK THE (P400) FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [15](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

15. CHECK THE (P400) FRONT RIGHT PASSIVE ENTRY HANDLE SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Measure the voltage between ground and the (P400) Front Right Passive Handle Switch Sense circuit at the RF Hub Module C2 harness connector.

Is there any voltage present?

Yes

- Repair the (P400) Front Right Passive Handle Switch Sense circuit for a short to voltage.
- With the scan tool, select "Diagnostic Procedures", "Reset ECU" and "RFH" and perform the routine.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [16](#)

16. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

B25A3-00-FRONT LEFT DOOR HANDLE SENSOR

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The Radio Frequency Hub Module (RFHM) microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The three switches of each Passive Entry (PE) outside door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFHM on a signal circuit, and a clean ground from the RFHM on a return circuit. The PE handle IC and the RFHM communicate with each other by modulating the current in the signal circuit.

Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFHM up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFHM determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected Key Fob.

The tactile, mechanical, resistive membrane lock switch allows the user to actively lock the vehicle. The capacitive switch senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch senses handle pull movement. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR DOOR HANDLE END CAP MAGNET VERIFICATION TEST



NOTE: To verify that the Exterior Door Handle End Cap Magnet is installed in the Handle End Cap, remove the Exterior Door Handle End Cap, use a metal paper clip and see if the paper clip will magnetically attach onto the inside of the Exterior Handle End Cap as shown above.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- During any ignition key position.

SET CONDITION

- The RF HUB has detected an internal exterior handle hall sensor or lock switch failure.

DEFAULT ACTION

- The exterior door handle will be inoperative.
- The customer must use the RKE or bladed key to enter the vehicle.

POSSIBLE CAUSES

Possible Causes
INCORRECT EXTERIOR DOOR HANDLE END CAP/MISSING MAGNET INSIDE OF HANDLE END CAP
EXTERIOR DOOR HANDLE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
2. With the scan tool, erase DTCs.
3. Try to lock or unlock the doors from the Exterior Door Handle with the FOB within range.
4. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR A SMART DOOR HANDLE MAGNET

1. Verify that the smart sensor (magnet) is present by removing the Door Handle End Cap and visually looking for a smart sensor (magnet) in the side of the door handle cap closest to the handle.

Is the smart sensor (magnet) in the door handle cap?

Yes

- Replace the Exterior Door Handle in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Replace the Front Exterior Door Handle Cap in accordance with the Service Information. Refer to [HANDLE, EXTERIOR, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B25A4-00-FRONT RIGHT DOOR HANDLE SENSOR

THEORY OF OPERATION

The Passive Entry (PE) antenna units allow the transmitter within the Radio Frequency Hub (also known as the RF Hub) to communicate via Low Frequency (LF) radio transmission with a Key Fob that is located inside the vehicle or, at most, about 2 meters (6.5 feet) horizontally in all directions around the outside of the vehicle. The RF Hub uses communication through the antenna units to wake up and challenge a Key Fob that is within range in order to authenticate whether that Key Fob is valid (programmed) to the vehicle. The RF Hub communicates with the Key Fob using Frequency-Shift Keying (FSK) modulation.

Each antenna unit has two dedicated connections to the RF Hub. One connection is the LF antenna output circuit, while the other connection is the LF antenna return circuit. These circuits to each antenna unit are a twisted pair to help reduce the potential for induced electrical interference. The Radio Frequency Hub Module (RFHM) microcontroller monitors all of the antenna units and will store a Diagnostic Trouble Code (DTC) for any fault that it detects.

The three switches of each Passive Entry (PE) outside door handle are powered by and provide a direct input to the Integrated Circuit (IC) of that door handle. The IC of each PE outside door handle receives power from the RFHM on a signal circuit, and a clean ground from the RFHM on a return circuit. The PE handle IC and the RFHM communicate with each other by modulating the current in the signal circuit.

Each PE outside door handle has three switches. The inputs from those three switches and the handle logic circuit allow each handle to send the RFHM up to four different signals: Unlock Request, Hall, Lock Request and Error. The RFHM determines the system response based upon the inputs it receives from each handle as well as the inputs it receives through the authentication process with each detected Key Fob.

The tactile, mechanical, resistive membrane lock switch allows the user to actively lock the vehicle. The capacitive switch senses a hand approaching the handle pull to passively unlock the vehicle. The Hall-effect switch senses handle pull movement. An adaptation algorithm in the logic circuit of each handle can modify the sensitivity of the capacitive switches as well as system responses to the Hall-effect switch inputs to compensate for sensed repeated or continuous actuations such as might be caused by the switch membrane being wetted, but restores normal sensitivity about one minute after the repeated or continuous actuation input ceases.

The hard wired inputs and outputs of the antenna units may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient, and accurate means to diagnose the antenna units requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR DOOR HANDLE END CAP MAGNET VERIFICATION TEST



NOTE: To verify that the Exterior Door Handle End Cap Magnet is installed in the Handle End Cap, remove the Exterior Door Handle End Cap, use a metal paper clip and see if the paper clip will magnetically attach onto the inside of the Exterior Handle End Cap as shown above.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- During any ignition key position.

SET CONDITION

- The RF HUB has detected an internal exterior handle hall sensor or lock switch failure.

DEFAULT ACTION

- The exterior door handle will be inoperative.
- The customer must use the RKE or bladed key to enter the vehicle.

POSSIBLE CAUSES

Possible Causes
INCORRECT EXTERIOR DOOR HANDLE END CAP/MISSING MAGNET INSIDE OF HANDLE END CAP EXTERIOR DOOR HANDLE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read Radio Frequency Hub Module (RFHM) DTCs and record on the repair order.
2. With the scan tool, erase DTCs.
3. Try to lock or unlock the doors from the Exterior Door Handle with the FOB within range.
4. With the scan tool, read RFHM DTCs.

Is the DTC active?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR A SMART DOOR HANDLE MAGNET

1. Verify that the smart sensor (magnet) is present by removing the Door Handle End Cap and visually looking for a smart sensor (magnet) in the side of the door handle cap closest to the handle.

Is the smart sensor (magnet) in the door handle cap?

Yes

- Replace the Exterior Door Handle in accordance with the Service Information. Refer to **HANDLE, EXTERIOR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the Front Exterior Door Handle Cap in accordance with the Service Information. Refer to **HANDLE, EXTERIOR, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

C1501-07-TIRE PRESSURE SENSOR 1-MECHANICAL FAILURES

THEORY OF OPERATION

NOTE:

Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) does not receive a message from the TPM sensor after a cumulative driving period of 20 minutes above 15 mph.
- The Tire Pressure Monitoring (TPM) Sensor pressure, temperature or accelerometer sensors have a mechanical failure.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) SENSOR HAS BEEN DAMAGED
TIRE PRESSURE MONITORING (TPM) SENSOR

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The TPM Sensor Mechanical Failure fault is not dependent upon other faults being addressed first. Because of this diagnostic strategy, the RFHM Module should not be considered for replacement while diagnosing this TPM Sensor Mechanical Failure fault.

1. Confirm the following before proceeding with this diagnostic test.
 - Perform any Technical Service Bulletins that may apply to this system.

- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record Radio Frequency Hub Module (RFHM) DTCs and the sensor IDs associated with the 'mechanical failure' DTC(s) that are active or have a multiple occurrence.

NOTE: Do not record or reference the positions, as they may be incorrect in the RFHM.

Is this DTC active or if the DTC is stored, are there multiple occurrences?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

3. READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

1. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

2. With the TPM-RKE Analyzer Tool, read all the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL OPERATION VERIFICATION

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool. Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) with the ID that corresponds to the DTC, noted previously in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#).
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Erase DTCs.
- Test Complete.

No

- Confirm the correct TPM Sensor ID(s) were written into the RFHM. If not repeat the programming procedure.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).
- Diagnose according to the appropriate DTC service procedure.

C1501-16-TIRE PRESSURE SENSOR 1-CIRCUIT VOLTAGE BELOW THRESHOLD

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was

converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) receives a low battery message from the Tire Pressure Monitor (TPM) sensor after a driving period greater than 15 mph (24km/h).
- Winter Mode is not active.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) SENSOR

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

C1501-31-TIRE PRESSURE SENSOR 1-NO SIGNAL

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- Ignition On Engine On
- With vehicle speed greater than 25 km/h (15 mph).
- Battery voltage is greater than 7.0 volts and less than 16 volts

SET CONDITION

- The RF Hub Module will monitor the signals from the active road tire TPM Sensors. This code sets if RF data is not received or cannot be accurately decoded after 20 minutes of cumulative vehicle speed above 15 mph during an ignition cycle.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS (ADDED ELECTRONICS)
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
RADIO FREQUENCY HUB (RF-HUB) MODULE

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The purpose of this test is to determine if there is a TPM sensor, EMC, Radio Frequency Hub Module (RFHM), or an external antenna issue. Once the issue has been identified, there is a drive verification test which utilizes the TPM display screen in the instrument panel for verification.

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Turn off, disconnect or disable (without damaging) any added electronic devices (not part of the original equipment) as they can interfere with RF TPM reception in the RFHM.
- Diagnose and repair any DTCs related to ABS speed signal, TPM mechanical failure, or non TPM related Radio Frequency Hub Module (RFHM) DTCs (i.e. Remote Start Antenna open or short) before continuing with this procedure and then perform the TPM Sensor Verification test. Refer to [STANDARD PROCEDURE](#) .
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is the most recent version available before proceeding. Do not assume that the

Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an outdated version will lead to incorrect diagnosis and part(s) replacement.

- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record all 4 Sensor IDs from the RFHM memory, noting which ones have an active or stored multiple occurrence DTC.

NOTE: Do not record or reference the exact wheel positions, as they may be incorrect in the RFHM.

3. With the scan tool, read the RFHM DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

3. VISUALLY INSPECT THEN READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

NOTE: This 'no signal' fault will set if the incorrect TPM Sensor or no TPM Sensor is installed on the vehicle. There should be no metal valve stems or valve stem caps on the rims.

1. Perform a visual inspection on each tire to verify that all road wheels are equipped with the correct TPM Sensors.
2. Install the correct Tire Pressure Monitoring (TPM) Sensor(s) as needed from the visual inspection, in accordance with the Service Information, but do not perform the TPM Verification Test at this time. Refer to [REMOVAL AND INSTALLATION](#) .
3. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year.

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

4. With the TPM-RKE Analyzer Tool read all of the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to determine a non responsive or missing sensor, and to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL ASSISTANCE

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK FOR A NON MATCHING ID

Did any sensor ID read with the TPM-RKE analyzer tool not match an ID in the RFHM?

Yes

- Program the IDs at their actual positions as read by the TPM-RKE Analyzer tool into the RFHM.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Go To [6](#)

6. CHECK FOR MULTIPLE ACTIVE NO SIGNAL DTC IN THE RFHM

Do all four tire locations have active "No Signal" DTCs in the RFHM?

Yes

- Go To [10](#)

No

- Go To [7](#)

7. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) at locations determined with the TPM-RKE Analyzer tool, that corresponds to the DTC and IDs from the RFHM (previously recorded), and replace any sensors that do not respond to the TPM-RKE Analyzer tool. Refer to **REMOVAL AND INSTALLATION**.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

Vehicles with added electronics installed

- Go To [8](#)

Vehicles without added electronics installed

- Go To [9](#)

No

- Go To [2](#)

8. TPM SYSTEM FUNCTION WITH ADDED ELECTRONIC DEVICES

1. With the scan tool, erase DTCs.
2. Turn on, connect or enable any electronic devices that have been previously turned off, disconnected or disabled.
3. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Go To [9](#)

No

- Repair the electronic device causing interference with the radio frequency TPM reception in the RFHM. Do not replace the RFHM Module.

9. CHECK FOR ACTIVE DTCS IN THE RFHM

1. With the scan tool, erase DTCs.
2. With the scan tool, read the RFHM Module DTCs.

Did the DTC return?

Yes

- Go To [13](#)

No

- Test Complete.

10. ALL TPM SENSORS SHOWING "NO SIGNAL" DTCS AS ACTIVE

1. With the TPM Sensor IDs noted previously from the TPM-RKE Analyzer tool, perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - Some or all pressure values are displaying correctly

- Go To [7](#)

No - None of the pressure values are displaying correctly

For vehicles with Remote Start feature

- Go To [11](#)

For vehicles without Remote Start feature

- Go To [12](#)

11. CHECK THE REMOTE START ANTENNA AND COAXIAL CABLE FOR RF INTERFERENCE.

1. Press the ignition off.
2. Disconnect the Remote Start coaxial cable from the RFHM.
3. With a known good Remote Start Antenna, connect it directly to the RFHM in place of the coaxial cable (allow it to hang).
4. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - ALL positions on the display updated

- Replace the Remote Start Antenna or Coaxial Cable as needed in accordance with Service Information. Refer to [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) .
- Perform the TPM SENSOR VERIFICATION TEST.

Refer to [STANDARD PROCEDURE](#) .

- Clear DTCs
- Test Complete

Yes - SOME positions on the display updated

- Go To [7](#)

No - NONE of the positions on the display updated

- Go To [12](#)

12. VERIFY TPM SENSOR IDS IN THE RFHM

1. Verify all TPM Sensor IDs have been written into the RFHM.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- With the scan tool, erase DTCs.
- Repair complete.

No

- Go To [13](#)

13. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio Frequency Hub Module (RFHM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION**.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C1501-4B-TIRE PRESSURE SENSOR 1-OVER TEMPERATURE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- Vehicle speed above 15 mph (24 km/h).
- The RF Hub Module (RF HUB) receives a message from the TPM sensor that an over temperature condition of 212°F (100°C) exists.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes		
TIRE PRESSURE MONITORING (TPM) SENSOR		
DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.

- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [**SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [**STANDARD PROCEDURE**](#) .
- Test Complete.

C1502-07-TIRE PRESSURE SENSOR 2-MECHANICAL FAILURES

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular

intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) does not receive a message from the TPM sensor after a cumulative driving period of 20 minutes above 15 mph.
- The Tire Pressure Monitoring (TPM) Sensor pressure, temperature or accelerometer sensors have a mechanical failure.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) SENSOR HAS BEEN DAMAGED
TIRE PRESSURE MONITORING (TPM) SENSOR

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The TPM Sensor Mechanical Failure fault is not dependent upon other faults being addressed first. Because of this diagnostic strategy, the RFHM Module should not be considered for replacement while diagnosing this TPM Sensor Mechanical Failure fault.

1. Confirm the following before proceeding with this diagnostic test.
 - Perform any Technical Service Bulletins that may apply to this system.
 - Verify the tire pressures are correct.

- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record Radio Frequency Hub Module (RFHM) DTCs and the sensor IDs associated with the 'mechanical failure' DTC(s) that are active or have a multiple occurrence.

NOTE: Do not record or reference the positions, as they may be incorrect in the RFHM.

Is this DTC active or if the DTC is stored, are there multiple occurrences?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

3. READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

1. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

2. With the TPM-RKE Analyzer Tool, read all the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL OPERATION VERIFICATION

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: **The ID read by the Tool must agree with the ID written on the side of the sensor housing.**

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool. Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) with the ID that corresponds to the DTC, noted previously in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Erase DTCs.
- Test Complete.

No

- Confirm the correct TPM Sensor ID(s) were written into the RFHM. If not repeat the programming procedure.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Diagnose according to the appropriate DTC service procedure.

C1502-16-TIRE PRESSURE SENSOR 2-CIRCUIT VOLTAGE BELOW THRESHOLD

THEORY OF OPERATION

NOTE: **Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was**

converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) receives a low battery message from the Tire Pressure Monitor (TPM) sensor after a driving period greater than 15 mph (24km/h).
- Winter Mode is not active.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) SENSOR

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

C1502-31-TIRE PRESSURE SENSOR 2-NO SIGNAL

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- Ignition On Engine On
- With vehicle speed greater than 25 km/h (15 mph).
- Battery voltage is greater than 7.0 volts and less than 16 volts

SET CONDITION

- The RF Hub Module will monitor the signals from the active road tire TPM Sensors. This code sets if RF data is not received or cannot be accurately decoded after 20 minutes of cumulative vehicle speed above 15 mph during an ignition cycle.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS (ADDED ELECTRONICS)
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
RADIO FREQUENCY HUB (RF-HUB) MODULE

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The purpose of this test is to determine if there is a TPM sensor, EMC, Radio Frequency Hub Module (RFHM), or an external antenna issue. Once the issue has been identified, there is a drive verification test which utilizes the TPM display screen in the instrument panel for verification.

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Turn off, disconnect or disable (without damaging) any added electronic devices (not part of the original equipment) as they can interfere with RF TPM reception in the RFHM.
- Diagnose and repair any DTCs related to ABS speed signal, TPM mechanical failure, or non TPM related Radio Frequency Hub Module (RFHM) DTCs (i.e. Remote Start Antenna open or short) before continuing with this procedure and then perform the TPM Sensor Verification test. Refer to [STANDARD PROCEDURE](#) .
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is the most recent version available before proceeding. Do not assume that the

Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an outdated version will lead to incorrect diagnosis and part(s) replacement.

- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record all 4 Sensor IDs from the RFHM memory, noting which ones have an active or stored multiple occurrence DTC.

NOTE: Do not record or reference the exact wheel positions, as they may be incorrect in the RFHM.

3. With the scan tool, read the RFHM DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

3. VISUALLY INSPECT THEN READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

NOTE: This 'no signal' fault will set if the incorrect TPM Sensor or no TPM Sensor is installed on the vehicle. There should be no metal valve stems or valve stem caps on the rims.

1. Perform a visual inspection on each tire to verify that all road wheels are equipped with the correct TPM Sensors.
2. Install the correct Tire Pressure Monitoring (TPM) Sensor(s) as needed from the visual inspection, in accordance with the Service Information, but do not perform the TPM Verification Test at this time. Refer to [REMOVAL AND INSTALLATION](#) .
3. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year.

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

4. With the TPM-RKE Analyzer Tool read all of the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to determine a non responsive or missing sensor, and to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL ASSISTANCE

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK FOR A NON MATCHING ID

Did any sensor ID read with the TPM-RKE analyzer tool not match an ID in the RFHM?

Yes

- Program the IDs at their actual positions as read by the TPM-RKE Analyzer tool into the RFHM.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Go To [6](#)

6. CHECK FOR MULTIPLE ACTIVE NO SIGNAL DTC IN THE RFHM

Do all four tire locations have active "No Signal" DTCs in the RFHM?

Yes

- Go To [10](#)

No

- Go To [7](#)

7. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) at locations determined with the TPM-RKE Analyzer tool, that corresponds to the DTC and IDs from the RFHM (previously recorded), and replace any sensors that do not respond to the TPM-RKE Analyzer tool. Refer to **REMOVAL AND INSTALLATION**.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

Vehicles with added electronics installed

- Go To [8](#)

Vehicles without added electronics installed

- Go To [9](#)

No

- Go To [2](#)

8. TPM SYSTEM FUNCTION WITH ADDED ELECTRONIC DEVICES

1. With the scan tool, erase DTCs.
2. Turn on, connect or enable any electronic devices that have been previously turned off, disconnected or disabled.
3. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Go To [9](#)

No

- Repair the electronic device causing interference with the radio frequency TPM reception in the RFHM. Do not replace the RFHM Module.

9. CHECK FOR ACTIVE DTCS IN THE RFHM

1. With the scan tool, erase DTCs.
2. With the scan tool, read the RFHM Module DTCs.

Did the DTC return?

Yes

- Go To [13](#)

No

- Test Complete.

10. ALL TPM SENSORS SHOWING "NO SIGNAL" DTCS AS ACTIVE

1. With the TPM Sensor IDs noted previously from the TPM-RKE Analyzer tool, perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - Some or all pressure values are displaying correctly

- Go To [7](#)

No - None of the pressure values are displaying correctly

For vehicles with Remote Start feature

- Go To [11](#)

For vehicles without Remote Start feature

- Go To [12](#)

11. CHECK THE REMOTE START ANTENNA AND COAXIAL CABLE FOR RF INTERFERENCE.

1. Press the ignition off.
2. Disconnect the Remote Start coaxial cable from the RFHM.
3. With a known good Remote Start Antenna, connect it directly to the RFHM in place of the coaxial cable (allow it to hang).
4. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - ALL positions on the display updated

- Replace the Remote Start Antenna or Coaxial Cable as needed in accordance with Service Information. Refer to [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) .
- Perform the TPM SENSOR VERIFICATION TEST.

Refer to [STANDARD PROCEDURE](#) .

- Clear DTCs
- Test Complete

Yes - SOME positions on the display updated

- Go To [7](#)

No - NONE of the positions on the display updated

- Go To [12](#)

12. VERIFY TPM SENSOR IDS IN THE RFHM

1. Verify all TPM Sensor IDs have been written into the RFHM.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- With the scan tool, erase DTCs.
- Repair complete.

No

- Go To [13](#)

13. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio Frequency Hub Module (RFHM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

C1502-4B-TIRE PRESSURE SENSOR 2-OVER TEMPERATURE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- Vehicle speed above 15 mph (24 km/h).
- The RF Hub Module (RF HUB) receives a message from the TPM sensor that an over temperature condition of 212°F (100°C) exists.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes		
TIRE PRESSURE MONITORING (TPM) SENSOR		
DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.

- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

C1503-07-TIRE PRESSURE SENSOR 3-MECHANICAL FAILURES

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular

intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) does not receive a message from the TPM sensor after a cumulative driving period of 20 minutes above 15 mph.
- The Tire Pressure Monitoring (TPM) Sensor pressure, temperature or accelerometer sensors have a mechanical failure.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) SENSOR HAS BEEN DAMAGED
TIRE PRESSURE MONITORING (TPM) SENSOR

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The TPM Sensor Mechanical Failure fault is not dependent upon other faults being addressed first. Because of this diagnostic strategy, the RFHM Module should not be considered for replacement while diagnosing this TPM Sensor Mechanical Failure fault.

1. Confirm the following before proceeding with this diagnostic test.
 - Perform any Technical Service Bulletins that may apply to this system.
 - Verify the tire pressures are correct.

- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record Radio Frequency Hub Module (RFHM) DTCs and the sensor IDs associated with the 'mechanical failure' DTC(s) that are active or have a multiple occurrence.

NOTE: Do not record or reference the positions, as they may be incorrect in the RFHM.

Is this DTC active or if the DTC is stored, are there multiple occurrences?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

3. READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

1. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

2. With the TPM-RKE Analyzer Tool, read all the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL OPERATION VERIFICATION

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: **The ID read by the Tool must agree with the ID written on the side of the sensor housing.**

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool. Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) with the ID that corresponds to the DTC, noted previously in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Erase DTCs.
- Test Complete.

No

- Confirm the correct TPM Sensor ID(s) were written into the RFHM. If not repeat the programming procedure.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Diagnose according to the appropriate DTC service procedure.

C1503-16-TIRE PRESSURE SENSOR 3-CIRCUIT VOLTAGE BELOW THRESHOLD

THEORY OF OPERATION

NOTE: **Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was**

converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) receives a low battery message from the Tire Pressure Monitor (TPM) sensor after a driving period greater than 15 mph (24km/h).
- Winter Mode is not active.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes		
TIRE PRESSURE MONITORING (TPM) SENSOR		
DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

C1503-31-TIRE PRESSURE SENSOR 3-NO SIGNAL

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- Ignition On Engine On
- With vehicle speed greater than 25 km/h (15 mph).
- Battery voltage is greater than 7.0 volts and less than 16 volts

SET CONDITION

- The RF Hub Module will monitor the signals from the active road tire TPM Sensors. This code sets if RF data is not received or cannot be accurately decoded after 20 minutes of cumulative vehicle speed above 15 mph during an ignition cycle.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS (ADDED ELECTRONICS)
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
RADIO FREQUENCY HUB (RF-HUB) MODULE

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The purpose of this test is to determine if there is a TPM sensor, EMC, Radio Frequency Hub Module (RFHM), or an external antenna issue. Once the issue has been identified, there is a drive verification test which utilizes the TPM display screen in the instrument panel for verification.

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Turn off, disconnect or disable (without damaging) any added electronic devices (not part of the original equipment) as they can interfere with RF TPM reception in the RFHM.
- Diagnose and repair any DTCs related to ABS speed signal, TPM mechanical failure, or non TPM related Radio Frequency Hub Module (RFHM) DTCs (i.e. Remote Start Antenna open or short) before continuing with this procedure and then perform the TPM Sensor Verification test. Refer to [STANDARD PROCEDURE](#) .
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is the most recent version available before proceeding. Do not assume that the

Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an outdated version will lead to incorrect diagnosis and part(s) replacement.

- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record all 4 Sensor IDs from the RFHM memory, noting which ones have an active or stored multiple occurrence DTC.

NOTE: Do not record or reference the exact wheel positions, as they may be incorrect in the RFHM.

3. With the scan tool, read the RFHM DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

3. VISUALLY INSPECT THEN READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

NOTE: This 'no signal' fault will set if the incorrect TPM Sensor or no TPM Sensor is installed on the vehicle. There should be no metal valve stems or valve stem caps on the rims.

1. Perform a visual inspection on each tire to verify that all road wheels are equipped with the correct TPM Sensors.
2. Install the correct Tire Pressure Monitoring (TPM) Sensor(s) as needed from the visual inspection, in accordance with the Service Information, but do not perform the TPM Verification Test at this time. Refer to [REMOVAL AND INSTALLATION](#) .
3. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year.

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

4. With the TPM-RKE Analyzer Tool read all of the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to determine a non responsive or missing sensor, and to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL ASSISTANCE

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK FOR A NON MATCHING ID

Did any sensor ID read with the TPM-RKE analyzer tool not match an ID in the RFHM?

Yes

- Program the IDs at their actual positions as read by the TPM-RKE Analyzer tool into the RFHM.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Go To [6](#)

6. CHECK FOR MULTIPLE ACTIVE NO SIGNAL DTC IN THE RFHM

Do all four tire locations have active "No Signal" DTCs in the RFHM?

Yes

- Go To [10](#)

No

- Go To [7](#)

7. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) at locations determined with the TPM-RKE Analyzer tool, that corresponds to the DTC and IDs from the RFHM (previously recorded), and replace any sensors that do not respond to the TPM-RKE Analyzer tool. Refer to **REMOVAL AND INSTALLATION**.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

Vehicles with added electronics installed

- Go To [8](#)

Vehicles without added electronics installed

- Go To [9](#)

No

- Go To [2](#)

8. TPM SYSTEM FUNCTION WITH ADDED ELECTRONIC DEVICES

1. With the scan tool, erase DTCs.
2. Turn on, connect or enable any electronic devices that have been previously turned off, disconnected or disabled.
3. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Go To [9](#)

No

- Repair the electronic device causing interference with the radio frequency TPM reception in the RFHM. Do not replace the RFHM Module.

9. CHECK FOR ACTIVE DTCS IN THE RFHM

1. With the scan tool, erase DTCs.
2. With the scan tool, read the RFHM Module DTCs.

Did the DTC return?

Yes

- Go To [13](#)

No

- Test Complete.

10. ALL TPM SENSORS SHOWING "NO SIGNAL" DTCS AS ACTIVE

1. With the TPM Sensor IDs noted previously from the TPM-RKE Analyzer tool, perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - Some or all pressure values are displaying correctly

- Go To [7](#)

No - None of the pressure values are displaying correctly

For vehicles with Remote Start feature

- Go To [11](#)

For vehicles without Remote Start feature

- Go To [12](#)

11. CHECK THE REMOTE START ANTENNA AND COAXIAL CABLE FOR RF INTERFERENCE.

1. Press the ignition off.
2. Disconnect the Remote Start coaxial cable from the RFHM.
3. With a known good Remote Start Antenna, connect it directly to the RFHM in place of the coaxial cable (allow it to hang).
4. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - ALL positions on the display updated

- Replace the Remote Start Antenna or Coaxial Cable as needed in accordance with Service Information. Refer to [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) .
- Perform the TPM SENSOR VERIFICATION TEST.

Refer to [STANDARD PROCEDURE](#) .

- Clear DTCs
- Test Complete

Yes - SOME positions on the display updated

- Go To [7](#)

No - NONE of the positions on the display updated

- Go To [12](#)

12. VERIFY TPM SENSOR IDS IN THE RFHM

1. Verify all TPM Sensor IDs have been written into the RFHM.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- With the scan tool, erase DTCs.
- Repair complete.

No

- Go To [13](#)

13. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio Frequency Hub Module (RFHM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION**.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

C1503-4B-TIRE PRESSURE SENSOR 3-OVER TEMPERATURE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- Vehicle speed above 15 mph (24 km/h).
- The RF Hub Module (RF HUB) receives a message from the TPM sensor that an over temperature condition of 212°F (100°C) exists.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes		
TIRE PRESSURE MONITORING (TPM) SENSOR		
DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.

- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [**SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [**STANDARD PROCEDURE**](#) .
- Test Complete.

C1504-07-TIRE PRESSURE SENSOR 4-MECHANICAL FAILURES

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular

intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) does not receive a message from the TPM sensor after a cumulative driving period of 20 minutes above 15 mph.
- The Tire Pressure Monitoring (TPM) Sensor pressure, temperature or accelerometer sensors have a mechanical failure.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) SENSOR HAS BEEN DAMAGED
TIRE PRESSURE MONITORING (TPM) SENSOR

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The TPM Sensor Mechanical Failure fault is not dependent upon other faults being addressed first. Because of this diagnostic strategy, the RFHM Module should not be considered for replacement while diagnosing this TPM Sensor Mechanical Failure fault.

1. Confirm the following before proceeding with this diagnostic test.
 - Perform any Technical Service Bulletins that may apply to this system.
 - Verify the tire pressures are correct.

- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record Radio Frequency Hub Module (RFHM) DTCs and the sensor IDs associated with the 'mechanical failure' DTC(s) that are active or have a multiple occurrence.

NOTE: Do not record or reference the positions, as they may be incorrect in the RFHM.

Is this DTC active or if the DTC is stored, are there multiple occurrences?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

3. READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

1. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

2. With the TPM-RKE Analyzer Tool, read all the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL OPERATION VERIFICATION

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool. Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) with the ID that corresponds to the DTC, noted previously in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#).
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Erase DTCs.
- Test Complete.

No

- Confirm the correct TPM Sensor ID(s) were written into the RFHM. If not repeat the programming procedure.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).
- Diagnose according to the appropriate DTC service procedure.

C1504-16-TIRE PRESSURE SENSOR 4-CIRCUIT VOLTAGE BELOW THRESHOLD

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was

converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- The RF Hub Module (RF HUB) receives a low battery message from the Tire Pressure Monitor (TPM) sensor after a driving period greater than 15 mph (24km/h).
- Winter Mode is not active.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes		
TIRE PRESSURE MONITORING (TPM) SENSOR		
DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .
- Test Complete.

C1504-31-TIRE PRESSURE SENSOR 4-NO SIGNAL

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- Ignition On Engine On
- With vehicle speed greater than 25 km/h (15 mph).
- Battery voltage is greater than 7.0 volts and less than 16 volts

SET CONDITION

- The RF Hub Module will monitor the signals from the active road tire TPM Sensors. This code sets if RF data is not received or cannot be accurately decoded after 20 minutes of cumulative vehicle speed above 15 mph during an ignition cycle.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS (ADDED ELECTRONICS)
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
RADIO FREQUENCY HUB (RF-HUB) MODULE

DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

NOTE: The purpose of this test is to determine if there is a TPM sensor, EMC, Radio Frequency Hub Module (RFHM), or an external antenna issue. Once the issue has been identified, there is a drive verification test which utilizes the TPM display screen in the instrument panel for verification.

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.
- Turn off, disconnect or disable (without damaging) any added electronic devices (not part of the original equipment) as they can interfere with RF TPM reception in the RFHM.
- Diagnose and repair any DTCs related to ABS speed signal, TPM mechanical failure, or non TPM related Radio Frequency Hub Module (RFHM) DTCs (i.e. Remote Start Antenna open or short) before continuing with this procedure and then perform the TPM Sensor Verification test. Refer to [STANDARD PROCEDURE](#) .
- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is the most recent version available before proceeding. Do not assume that the

Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an outdated version will lead to incorrect diagnosis and part(s) replacement.

- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. CHECK FOR AN ACTIVE DTC

1. Press the ignition on.
2. With the scan Tool, read and record all 4 Sensor IDs from the RFHM memory, noting which ones have an active or stored multiple occurrence DTC.

NOTE: Do not record or reference the exact wheel positions, as they may be incorrect in the RFHM.

3. With the scan tool, read the RFHM DTCs.

Is the DTC active?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

3. VISUALLY INSPECT THEN READ ALL TPM SENSORS WITH THE TPM-RKE ANALYZER TOOL

NOTE: This 'no signal' fault will set if the incorrect TPM Sensor or no TPM Sensor is installed on the vehicle. There should be no metal valve stems or valve stem caps on the rims.

1. Perform a visual inspection on each tire to verify that all road wheels are equipped with the correct TPM Sensors.
2. Install the correct Tire Pressure Monitoring (TPM) Sensor(s) as needed from the visual inspection, in accordance with the Service Information, but do not perform the TPM Verification Test at this time. Refer to [REMOVAL AND INSTALLATION](#) .
3. With the TPM-RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) at the most recent version, select the specific vehicle line and model year.

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

4. With the TPM-RKE Analyzer Tool read all of the TPM Sensors on the vehicle and record their IDs and positions.

NOTE: The purpose of the TPM-RKE Analyzer Tool is to determine a non responsive or missing sensor, and to identify the location of the sensor by the ID associated to the DTC.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RFHM recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did all or at least one TPM sensor respond and match an ID stored in the Radio Frequency Hub Module (RFHM)?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL ASSISTANCE

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK FOR A NON MATCHING ID

Did any sensor ID read with the TPM-RKE analyzer tool not match an ID in the RFHM?

Yes

- Program the IDs at their actual positions as read by the TPM-RKE Analyzer tool into the RFHM.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Go To [6](#)

6. CHECK FOR MULTIPLE ACTIVE NO SIGNAL DTC IN THE RFHM

Do all four tire locations have active "No Signal" DTCs in the RFHM?

Yes

- Go To [10](#)

No

- Go To [7](#)

7. CHECK TPM SENSOR IDENTIFICATION TO THE CORRESPONDING DTC

1. Replace the TPM Sensor(s) at locations determined with the TPM-RKE Analyzer tool, that corresponds to the DTC and IDs from the RFHM (previously recorded), and replace any sensors that do not respond to the TPM-RKE Analyzer tool. Refer to **REMOVAL AND INSTALLATION**.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

Vehicles with added electronics installed

- Go To [8](#)

Vehicles without added electronics installed

- Go To [9](#)

No

- Go To [2](#)

8. TPM SYSTEM FUNCTION WITH ADDED ELECTRONIC DEVICES

1. With the scan tool, erase DTCs.
2. Turn on, connect or enable any electronic devices that have been previously turned off, disconnected or disabled.
3. Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- Go To [9](#)

No

- Repair the electronic device causing interference with the radio frequency TPM reception in the RFHM. Do not replace the RFHM Module.

9. CHECK FOR ACTIVE DTCS IN THE RFHM

1. With the scan tool, erase DTCs.
2. With the scan tool, read the RFHM Module DTCs.

Did the DTC return?

Yes

- Go To [13](#)

No

- Test Complete.

10. ALL TPM SENSORS SHOWING "NO SIGNAL" DTCS AS ACTIVE

1. With the TPM Sensor IDs noted previously from the TPM-RKE Analyzer tool, perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - Some or all pressure values are displaying correctly

- Go To [7](#)

No - None of the pressure values are displaying correctly

For vehicles with Remote Start feature

- Go To [11](#)

For vehicles without Remote Start feature

- Go To [12](#)

11. CHECK THE REMOTE START ANTENNA AND COAXIAL CABLE FOR RF INTERFERENCE.

1. Press the ignition off.
2. Disconnect the Remote Start coaxial cable from the RFHM.
3. With a known good Remote Start Antenna, connect it directly to the RFHM in place of the coaxial cable (allow it to hang).
4. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes - ALL positions on the display updated

- Replace the Remote Start Antenna or Coaxial Cable as needed in accordance with Service Information. Refer to [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) [ANTENNA, REMOTE START, REMOVAL AND INSTALLATION](#) .
- Perform the TPM SENSOR VERIFICATION TEST.

Refer to [STANDARD PROCEDURE](#) .

- Clear DTCs
- Test Complete

Yes - SOME positions on the display updated

- Go To [7](#)

No - NONE of the positions on the display updated

- Go To [12](#)

12. VERIFY TPM SENSOR IDS IN THE RFHM

1. Verify all TPM Sensor IDs have been written into the RFHM.
2. Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

Was the TPM SENSOR VERIFICATION TEST successful and did values for the pressures display correctly?

Yes

- With the scan tool, erase DTCs.
- Repair complete.

No

- Go To [13](#)

13. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Radio Frequency Hub Module (RFHM) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RFHM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RFHM DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION**.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C1504-4B-TIRE PRESSURE SENSOR 4-OVER TEMPERATURE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously under the following conditions:

- All ignition positions.

SET CONDITION

- Battery voltage is greater than 7.0 volts and less than 16.0 volts.
- Vehicle speed above 15 mph (24 km/h).
- The RF Hub Module (RF HUB) receives a message from the TPM sensor that an over temperature condition of 212°F (100°C) exists.

DEFAULT ACTION

- TPM malfunction indicator will Flash for 75 seconds and then be illuminated ON solid.
- Premium systems "Service TPM System" message displayed and dashes instead of the pressure values for the wheel.

POSSIBLE CAUSES

Possible Causes		
TIRE PRESSURE MONITORING (TPM) SENSOR		
DTC	SENSOR NUMBER	WHEEL POSITION
C1501	1	Front Left
C1502	2	Front Right
C1503	3	Rear Right
C1504	4	Rear Left

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.

- Perform any Technical Service Bulletins that may apply to this system.

- Verify the tire pressures are correct.
- Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is at the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an out dated version will lead to incorrect diagnosis and part(s) replacement.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were the TPM system checks and TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [2](#)

No

- Complete all the TPM system checks listed and verify the TPM-RKE Analyzer tool version.

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Verify the faulty TPM Sensor and replace the TPM Sensor with the ID that corresponds to the DTC in accordance with Service Information. Refer to [**SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION**](#) .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [**STANDARD PROCEDURE**](#) .
- Test Complete.

C151C-51-TIRE PRESSURE SENSORS MISSING-NOT PROGRAMMED

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular

intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously when the following condition are met:

- During vehicle TPM Sensor ID locate process.
- Battery voltage is between 8.2 volts and 16.8 volts.

SET CONDITION

- When installing a new Radio Frequency Module (RFHM).

DEFAULT ACTION

- The TPM malfunction indicator will Flash for 75 seconds and then stay on solid.
- Premium systems "Service TPM System" message displayed and the chime will sound.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
INCORRECT TIRE PRESSURE MONITORING (TPM) SENSOR ID(S)
TIRE PRESSURE MONITORING (TPM) SENSOR
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **[TESTING FOR AN INTERMITTENT CONDITION](#)**.

2. TPM-RKE ANALYZER 2046300080

Is there a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) available?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. WITH TPM-RKE TOOL CHECK TIRE PRESSURE MONITORING (TPM) SENSOR ID(S)

NOTE: Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the Sensor. If the incorrect vehicle line and/or model year is selected, the Sensor will not respond to the tool.

NOTE: If you receive no response from any of the tire pressure sensors, check to make sure that the TPM-RKE Analyzer is set correctly, and repeat the process on each of the non-responsive wheel(s)

1. Use a TPM-RKE Analyzer at the most current version available (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for an ID, store in the proper location in the TPM-RKE Analyzer.
2. Use a TPM-RKE Analyzer to upload the correct IDs and proper locations in the scan tool.
3. With the scan tool, select the RF Hub Module under "Miscellaneous Functions", follow the procedure for uploading TPM Sensor IDs.
4. With the scan tool, erase RF Hub Module DTCs.
5. Test drive the vehicle at a speed greater than 32 km/h (20 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
6. With the scan tool, check to see if the TPM sensor IDs match what is programmed into the RF Hub Module.

Do the TPM IDs match?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

4. WITHOUT TPM-RKE TOOL CHECK TIRE PRESSURE MONITORING (TPM) SENSOR ID(S)

1. Press the ignition on.
2. Starting with the left front wheel, deflate the tire to 20 PSI, wait two minutes, and check the scan tool for changes to any compensated tire pressure values.
3. Repeat the above step on each wheel of the vehicle.

4. With the scan tool, erase RF Hub Module DTCs.
5. Test drive the vehicle at a speed greater than 32 km/h (20 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
6. With the scan tool, check to see if the TPM sensor IDs are programmed into the RF Hub Module.

Are the TPM Sensor IDs in the RF Hub Module?

Yes

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

No

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE** .

C151D-00-TIRE PRESSURE SENSOR LOCATION UNDETERMINED

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- During vehicle TPM Sensor location process.

SET CONDITION

- When the localization sequence does not complete a total of 10 times consecutively for a single placard vehicle or 1 time for a split placard vehicle.
- Will fail TPM locate process if two or more sensors fail to determine positions during localization sequence.
- If missing TPM Sensors are present on first drive, this DTC will set to show that the TPM Sensor location cannot be determined/guaranteed (cannot revert to last known good locations).

DEFAULT ACTION

- In the event the localization process has been unsuccessful 1 time for a split placard vehicle: TPM malfunction indicator will flash for 75 seconds and then be illuminated ON solid.

- Premium systems "Service TPM System" message displayed and dashes instead of pressure values for the wheels. In the event localization fails 10 consecutive times for a single placard vehicle.
- No driver perception of failure, DTC raised to indicate fault to service technician at the time of service.
- Last known wheel positions used to display pressure values on Instrument Cluster (IC).

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
TPM SENSOR ID AUTO LEARNING NOT COMPLETED
TIRE PRESSURE MONITORING (TPM) SENSOR
RADIO FREQUENCY HUB (RF-HUB) MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. TIRE PRESSURE MONITOR SYSTEM CHECK

1. Confirm the following before proceeding with this diagnostic test.
 - Perform any Technical Service Bulletins that may apply to this system.
 - Diagnose and repair **ALL** other TPM, RF Hub and ABS DTCs **first** before continuing with this procedure.
 - Turn off, disconnect or disable (without damaging) any added electronic devices (not part of the original equipment) as they can interfere with RF TPM reception in the RF Hub.
 - Verify the tire pressures are correct.
 - Verify the TPM - RKE Analyzer Tool (special tool #2046300080, Kit, TPM/RKE ANALYZER) is the most recent version available before proceeding. Do not assume that the Tool is at the most current version available. Use of a TPM-RKE Analyzer Tool with an outdated version will lead to incorrect diagnosis and part(s) replacement.

- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or up dating concerns to the TPM-RKE Analyzer Tool.

Were ALL other TPM, RF Hub & ABS DTCs repaired, system checks, and the TPM-RKE Analyzer tool version confirmed?

Yes

- Go To [3](#)

No

- Complete/Repair all other TPM, RF Hub & ABS DTCs, system checks listed and verify the TPM-RKE Analyzer tool version.

3. RECORD THE TPM SENSOR IDS IN THE RF HUB

NOTE: To perform this test, the vehicle and wheels must not have been moved for the last 19 minutes. Failure to allow 19 minutes of no movement prior to checking could give incorrect results leading to incorrect replacement of TPM sensors.

1. With the scan Tool, record all 4 (6 dually applications) Sensor IDs from the RF Hub memory.

NOTE: Do not record or reference the exact wheel positions, as they may be incorrect in the RF HUB.

2. With the TPM-RKE Analyzer Tool at the most recent version, select the specific vehicle line and model year.

NOTE: If the incorrect vehicle line or model year are selected the TPM sensor may not respond to the TPM-RKE Analyzer Tool.

3. With the TPM-RKE Analyzer Tool, read all the TPM Sensors on the vehicle, record their IDs, wheel positions, and operation state (the TPM Sensors should be in the PARK mode). If a sensor doesn't read the first time, try several more times.

NOTE: There is a remote possibility the TPM-RKE Analyzer Tool can read a TPM Sensor from a different vehicle, instead of the vehicle being tested. If a sensor ID read by the TPM-RKE Analyzer Tool does not match any of the IDs in the RF Hub recorded earlier, relocate vehicles to a proximity that is greater than 10 feet and repeat reading.

Did any of the TPM sensor IDs read match an ID stored in the RF Hub?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. TPM-RKE ANALYZER TOOL OPERATION VERIFICATION

1. With the TPM-RKE Analyzer Tool attempt to read a new TPM Sensor (one not installed) from stock or a known good vehicle of the same year and model.

NOTE: The ID read by the Tool must agree with the ID written on the side of the sensor housing.

Does the TPM-RKE Analyzer Tool read the new TPM Sensor from stock or the known good vehicle with the same year and model?

Yes

- Go To [5](#)

No

- There is an issue with the TPM-RKE tool.
- Contact the TPM-RKE Analyzer Tool help desk for assistance with any repair or updating concerns to the TPM-RKE Analyzer Tool.

5. CHECK FOR PARK MODE

Did any sensor have no response to the TPM -RKE Analyzer tool or in a mode other than PARK MODE?

Yes

- Non responding or wrong mode sensors should be replaced. Prior to replacing the sensor, read and record the new ID with the TPM RKE Analyzer tool and compare to the ID number on the housing to confirm they match. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION**.
- After replacing any indicated sensors and remounting the wheels, use the TPM RKE Analyzer tool to record the positions of the IDs now on the vehicle and verify in the PARK mode. If a sensor is not in PARK mode, put the sensor in the PARK mode with the Analyzer tool
- Go To [6](#)

No

- Go To [6](#)

6. PERFORM A LOCALIZATION TEST

NOTE: This test makes it easy to drive and view on the TPM display screen that TPM Sensors messages are being received and when they are located. Low pressure warnings may occur on split placard (ex 60 psi front and 80 psi rear) vehicles until the system completes auto-location successfully.

1. With the scan tool, write false IDs into each of the sensors locations in the RF Hub as follows: Sensor 1 = 11111111, Sensor 2 = 22222222, Sensor 3 = 33333333, Sensor 4 = 44444444, and if dually vehicle Sensor 6 = 66666666, Sensor 7 = 77777777). This will cause the TPM display pressure values to go to dashes on the TPM display of the Cluster.
2. Using the sensor IDs recorded earlier with the TPM RKE Analyzer tool, write the sensor IDs into the RF Hub one position clockwise more than the actual position (i.e. the Sensor ID at FL is written into the RF Hub FR (sensor 1) position: Sensor ID at FR written into RR,••). For inner dual wheel vehicles, the Inner RR sensor ID is written into RF Hub at the Inner RL position and the Inner RL Sensor ID is written into the RF Hub at the inner RR position). Programming the IDs will set the C151D-00 DTC to stored.
3. Adjust tire pressure such that the tires on the same axle are at the same pressure, but the pressures between axles are noticeably different (5 psi). On split placard vehicles, no pressure adjustment is necessary since there is at least a 5 psi difference between axles. For Inner dual wheel applications, set the inner RL sensor 5 psi lower than the inner RR sensor.
4. It is important to turn the ignition off and then back on after writing the IDs and prior to the drive. Drive the vehicle in 2 WD greater than 15 mph (when possible). Pressures should replace the

dashes shortly after the drive starts, but the pressure values should be shown in the wrong positions.

5. Driving in a several mile loop should expedite the location process. Stop the drive when the correct pressures are in the correct positions or 20 cumulative minutes at speeds exceed 15 mph has occurred.

Did the correct pressure values get moved to the correct locations?

Yes

- The condition or conditions that originally set this DTC are not present at this time. Inspect ABS wheel sensors for damage or incorrect mounting and harness connector for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension and repair as necessary if no other repairs were made.
- Clear DTCs.
- Adjust Tire pressures to placard requirement, test complete.

No

- Go To [7](#)

7. CHECK THE TPM SENSOR STATE

1. Within 10 minutes of completing the localization test drive (vehicle moving above 15 mph), read all of the TPM sensors with the TPM RKE Analyzer tool, recording the ID and operating mode it is in.

Are all sensors in the INTERIM mode?

Yes

- Repair Complete.

No

- Replace any sensor not in the INTERM mode. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .
- Place all sensors into the PARK mode using the TPM/RKE Analyzer tool.
- Go To

C1597-00-TPM SYSTEM DEACTIVATED - WINTER MODE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- During vehicle TPM Sensor location process.
- Battery voltage is between 8.2 volts and 16.8 volts.

SET CONDITION

- All four TPM sensors have failed at the same time.
- The TPM sensors are not installed on winter tire and wheel assemblies.

DEFAULT ACTION

- Indication lamp will flash for 75 seconds and remain ON when detected, "Service TPM System" message displayed. Pressure values replaced by dashes. No Chime sounds. Lamp will remain OFF on next ignition cycle and a WINTER MODE" text shall be displayed.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
TIRE PRESSURE MONITORING (TPM) SENSORS NOT PRESENT
TIRE PRESSURE MONITORING (TPM) SENSORS
RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. TIRE PRESSURE MONITORING (TPM) WINTER MODE

NOTE: Repair all other RFHM DTCs before continuing with this test procedure.

1. Turn the ignition off.

2. Turn the ignition from off to on.
3. Check for the following conditions:
 - The warning lamp is off.
 - The tire pressure values in the Instrument Cluster are displayed as dashes.
 - The message center **is not** displaying "SERVICE TPM SYSTEM".

Are all of the above conditions correct?

Yes

- The RFHM is now in deactivation mode (Winter Mode). This DTC will remain active until the correct tire and wheel assemblies are installed back on the vehicle. Once one of the correct tire and wheel assemblies are reinstalled, the other three must also be reinstalled prior to turning the ignition on.

No

- Go To [3](#)

3. TIRE PRESSURE MONITORING (TPM) SENSORS

1. Turn the ignition off.
2. Verify the correct TPM Sensors are installed in all of the tire and wheel assemblies.

NOTE: Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the Sensor. If the incorrect vehicle line and/or model year is selected, the Sensor will not respond to the tool.

NOTE: If you receive no response from any of the tire pressure sensors, check to make sure that the TPM-RKE Analyzer is set correctly, and repeat the process on each of the non-responsive wheel(s)

3. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for an ID, store in the proper location in the TPM-RKE Analyzer.

Are the correct TPM Sensors installed?

Yes

- Replace the Radio Frequency Hub Module (RFHM) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .
- Perform the RADIO FREQUENCY HUB (RF HUB) VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Install all new Tire Pressure Monitoring (TPM) Sensors in accordance with the Service Information. Refer to [SENSOR, TIRE PRESSURE MONITORING \(TPM\), REMOVAL AND INSTALLATION](#) .
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#)

C15CB-00-FRONT AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- While driving.

SET CONDITION

- The Radio Frequency Hub Module (RFHM) has learned incorrect tire pressure threshold configuration from the Body Control Module (BCM).

DEFAULT ACTION

- The TPM malfunction indicator will Flash for 75 seconds and then stay on solid.
- Premium systems "Service TPM System" message displayed and the chime will sound.

POSSIBLE CAUSES

Possible Causes
INCORRECT TIRE PRESSURE CONFIGURATION LEARNED IN THE RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. PERFORM A RESTORE VEHICLE CONFIGURATION

NOTE: This DTC is not active while in "Winter" Mode.

1. With the scan tool, perform a restore vehicle configuration.
2. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
3. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Repeat this test.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**

No

- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE**

C15CC-00-REAR AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE

THEORY OF OPERATION

NOTE: Starting June 7, 2021, the tire pressure monitoring functions were incorporated into the Radio Frequency Hub (RFH) Module and the TPM module was converted to a module that allowed Controller Area Network (CAN) functions only, no TPM functions.

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Radio Frequency Hub (RF Hub) Module.

The TPM sensor signal is sent from the sensor to the Remote Start Antenna (if equipped). On vehicles without remote start, the signal is sent to the RF Hub internal RKE antenna.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- While driving.

SET CONDITION

- The Radio Frequency Hub Module (RFHM) has learned incorrect tire pressure threshold configuration from the Body Control Module (BCM).

DEFAULT ACTION

- The TPM malfunction indicator will Flash for 75 seconds and then stay on solid.
- Premium systems "Service TPM System" message displayed and the chime will sound.

POSSIBLE CAUSES

Possible Causes
INCORRECT TIRE PRESSURE CONFIGURATION LEARNED IN THE RADIO FREQUENCY HUB MODULE (RFHM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. PERFORM A RESTORE VEHICLE CONFIGURATION

NOTE: This DTC is not active while in "Winter" Mode.

1. With the scan tool, perform a restore vehicle configuration.
2. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
3. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Repeat this test.
- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

No

- Perform the TPM SENSOR VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#).

For a complete STARTING SYSTEM wiring diagram, **Refer to the appropriate wiring information .**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While driving and shifting gears.

SET CONDITION

- The Radio Frequency Hub (RF Hub) does not detect changes in the Clutch Interlock Signal circuit voltage while CAN messages from the Transmission Control Module indicate transmission gear changes.

DEFAULT ACTION

- When this DTC sets active, the driver shall remain deactivated until the next ignition OFF/ON cycle.

POSSIBLE CAUSES

Possible Causes
CLUTCH INTERLOCK SIGNAL CIRCUIT SHORTED TO VOLTAGE
CLUTCH INTERLOCK SIGNAL CIRCUIT SHORTED TO GROUND
CLUTCH INTERLOCK SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
CLUTCH INTERLOCK SWITCH
RADIO FREQUENCY MODULE (RF HUB)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE (T12) CLUTCH SWITCH POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

3. CHECK THE (Z915) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

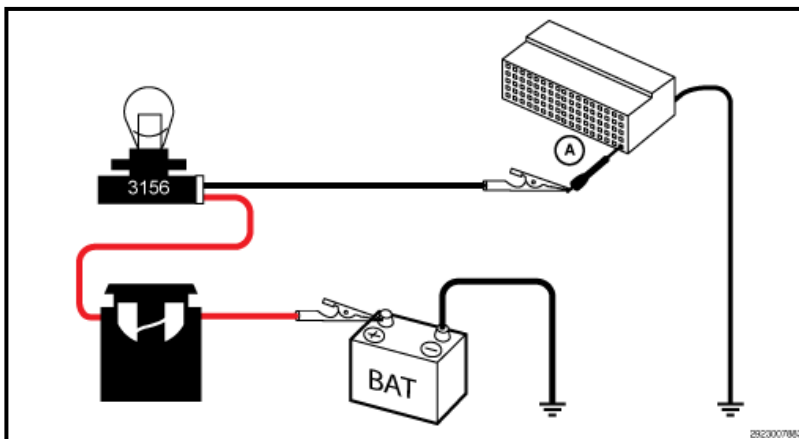
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

4. CHECK THE (T12) CLUTCH SWITCH POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition on.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Disconnect the RF HUB C1 harness connector.

4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: **There should be no voltage on this circuit.**

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage. Use the wiring diagram as a guide to follow the path of the circuit.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (T12) CLUTCH SWITCH POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. REPLACE THE CLUTCH PEDAL SWITCH AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information. Refer to [**SWITCH, CLUTCH STARTER INTERLOCK, REMOVAL AND INSTALLATION**](#) . With Scan tool, perform the Clutch Pedal Position Sensor Learn routine. The Clutch Pedal Position Sensor Learn routine must be performed every time there has been a repair/replacement made to a Clutch Position Sensor, PCM or Clutch Pedal Assembly. Failure to do so can cause the Clutch Position Not Learned DTC to set.
2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.

4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to [MODULE, RADIO FREQUENCY \(RF HUB\), REMOVAL AND INSTALLATION](#) .

- Perform the RADIO FREQUENCY HUB MODULE (RF HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Perform the RADIO FREQUENCY HUB MODULE (RF HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .
- Test complete.

U0001-00-CAN C BUS

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [**DIAGNOSIS AND TESTING**](#) .

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [**DIAGNOSIS AND TESTING**](#) .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: Perform this diagnostic procedure **ONLY** when the DTC status is "Active". If the DTC status is "Stored" **DO NOT** proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0102-00-LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0103-00-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0151-00-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0154-00-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0155-00-LOST COMMUNICATION WITH CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U103C-00-KIN-IGNM COMMUNICATION

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions.
- Radio frequency Hub (RF Hub) is awake.
- Battery voltage within range.

SET CONDITION

- Whenever the Radio Frequency Hub (RF Hub) detects an open, or a short to ground on the Security K Line Communication circuit, this code will set.

DEFAULT ACTION

- Electronic Vehicle Information Center (EVIC) message "Service Keyless System."
- Transponder Mode is not possible.
- Possibly no illumination on the Keyless Ignition Node (KIN).

POSSIBLE CAUSES

Possible Causes
FUSED B+ CIRCUIT OR GROUND CIRCUIT HAS HIGH RESISTANCE
SECURITY K LINE COMMUNICATION CIRCUIT SHORTED TO GROUND
SECURITY K LINE COMMUNICATION CIRCUIT OPEN
KEYLESS IGNITION NODE (KIN)
RADIO FREQUENCY HUB (RF HUB)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE FUSED (B+) CIRCUIT TO THE KEYLESS IGNITION NODE (KIN) FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE:

Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE:

A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a

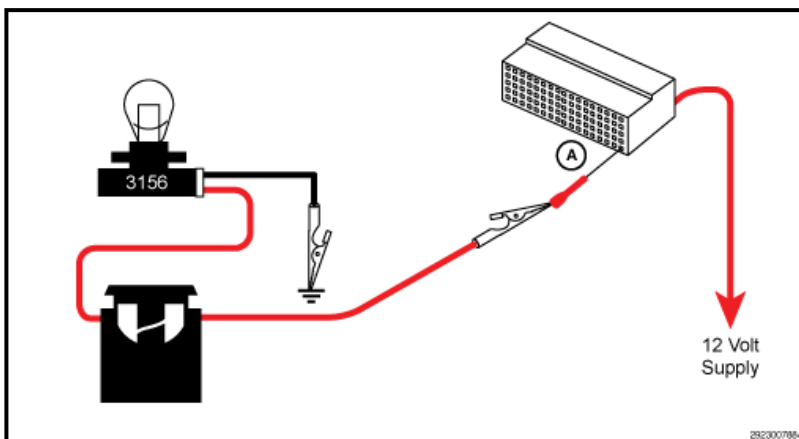
circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE (D122) SECURITY K LINE CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D122) SECURITY K LINE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

5. REPLACE THE KEYLESS IGNITION NODE (KIN) AND RETEST FOR DTCS

1. Replace the component in accordance with the Service Information.

Refer to [**MODULE, KEYLESS IGNITION NODE \(KIN\), REMOVAL AND INSTALLATION**](#) .

2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

U115F-00-LOST COMMUNICATION WITH DRIVER PRESENCE DETECTION MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U140E-00-IMPLAUSIBLE VEHICLE CONFIGURATION DATA RECEIVED

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1433-01-IMPLAUSIBLE IGNITION SWITCH STATUS MESSAGE RECEIVED

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions.
- The Bus is awake
- Battery voltage is between 10.0-16.0 volts.
- No Active CAN DTCs (U0001-00, U0002-00).

SET CONDITION

- The Radio Frequency Hub (RF Hub) receives a Bussed Input message of the Ignition Switch status from the Body Control Module (BCM). If that message does not agree with the RF Hub Ignition Switch status, this code will set. The Radio Frequency Hub (RF HUB) also sends an Ignition Switch "Sensor" message (hard wired Ignition Run/Start circuit). If the RF Hub and the BCM do not agree on both of those messages, the BCM will not allow the engine to start.

DEFAULT ACTION

- The three ignition LED indicators on the Keyless Ignition Node (KIN) will blink since the vehicle ignition status is not known.

POSSIBLE CAUSES

Possible Causes
ACTIVE U1433-23 OR U1433-24 DTCS IN THE BCM
IGNITION RUN/START OUTPUT CIRCUIT OPEN
IGNITION RUN/START OUTPUT CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE (BCM)
RADIO FREQUENCY HUB (RF HUB)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Press the ignition off for a minimum of 10.0 seconds.
5. Press the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **[TESTING FOR AN INTERMITTENT CONDITION](#)** .

2. CHECK FOR ACTIVE BODY CONTROL MODULE (BCM) DTCS

1. With the scan tool, read BCM DTCS.

Are there any active DTCS such as U1433-23 or U1433-24?

Yes

- Repair BCM DTCS. Refer to **[DIAGNOSIS AND TESTING](#)** .
- Perform the BODY VERIFICATION TEST. Refer to **[BODY VERIFICATION TEST](#)** .

No

- Go To [3](#)

3. CHECK FOR VOLTAGE ON THE (F20) or (K618) RUN/START OUTPUT CIRCUIT AT THE BODY CONTROL MODULE (BCM)

1. Press the ignition off.
2. Disconnect the appropriate BCM harness connector.
3. Press the ignition on.

4. Measure the voltage on the (F20) or (K618) Ignition Run/Start Output circuit at the BCM harness connector.

Is the voltage above 10.0 volts?

Yes

- Replace the Body Control Module in accordance with the Service Information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To **4**

4. ISOLATE AND CHECK THE (F20) or (K618) RUN/START OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To **5**

No

- Repair the circuit for an open or high resistance.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST**.

5. ISOLATE AND CHECK THE (F20) or (K618) RUN/START OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RF HUB harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RF HUB harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RF HUB DTCs.

Did the DTC return?

Yes

- Replace the Radio Frequency Hub Module (RF HUB) in accordance with the Service Information. Refer to **MODULE, RADIO FREQUENCY (RF HUB), REMOVAL AND INSTALLATION** .

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .

No

- Perform the RADIO FREQUENCY HUB (RF-HUB) VERIFICATION TEST. Refer to **RADIO FREQUENCY (RF HUB) VERIFICATION TEST** .
- Test complete.

U1517-62-BODY CONTROLLER SECRET CODE-SIGNAL COMPARE FAILURE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U1517-87-BODY CONTROLLER SECRET CODE-MISSING MESSAGE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

2021 ACCESSORIES AND BODY, CAB

Radio Frequency Module (RF HUB) - Pre-Diagnostic Procedure, Intermittent Test & Verification Tests - Gladiator

STANDARD PROCEDURE

THEFT AND SECURITY SYSTEMS-PRE-DIAGNOSTIC PROCEDURE

Before attempting to repair any theft or security system, technicians should be familiar with and fully understand the system operation. Refer to the Theft and Security System Description and Operation for complete details. Refer to [DESCRIPTION AND OPERATION](#).

THEFT AND SECURITY SYSTEMS PRE-DIAGNOSTIC PROCEDURE

1. FOLLOW THE BASIC OUTLINE SET FORTH IN THE SIX-STEP TROUBLESHOOTING PROCEDURE

1. Verification of complaint.
2. Verification of any related symptoms.
3. Symptom analysis.
4. Problem isolation.
5. Repair of isolated problem.
6. Verification of proper operation.

2. TAKE INTO ACCOUNT CURRENT VEHICLE CONDITION, REPAIR HISTORY, AND TECHNICAL SERVICE BULLETINS (TSB's)

1. Verify there are no outward signs of vehicle damage that could impact the proper operation of the theft or security system. Check for aftermarket vehicle accessories that may have been installed improperly or could interfere with the system
2. Check the vehicle repair history for repairs that may relate to the current condition.
3. Perform a check of current Technical Service Bulletins (TSB) for the Theft/Security system related to the customer concern. If a TSB applies, follow the procedure outlined in the TSB.

3. DIAGNOSE ONLY THOSE FAILURES THAT ARE ACTIVE AND CAN BE REPRODUCED

1.
 - Check the control module central to the subsystem that is exhibiting the condition for active DTCs
 - For an intermittent failure that is not current at the time of vehicle inspection, refer to the THEFT AND SECURITY SYSTEM INTERMITTENT TEST and document the event on the repair order. Refer to [THEFT AND SECURITY SYSTEM INTERMITTENT TEST](#).

4. ADDRESS ACTIVE DIAGNOSTIC TROUBLE CODES (DTCS) IN THE CORRECT ORDER

1. As a general rule, for any theft/security system control module that exhibits more than one active DTC, address the codes in the order indicated:
 1. Low/High Voltage and Serial Data Loss of Communication Codes
 2. Module Internal Failure and Configuration Mismatch Codes
 3. Circuit specific DTC failures
2. Should the malfunction still be present after conducting this Pre-diagnostic Procedure, technicians should continue to the appropriate DTC procedure or symptom diagnostic.
3. For DTC Procedures, and perform the appropriate Diagnostic Procedure. Refer to [DIAGNOSIS AND TESTING](#).
4. For Symptom Diagnostics. Refer to [DIAGNOSIS AND TESTING](#).

THEFT AND SECURITY SYSTEM INTERMITTENT TEST

DIAGNOSTIC TEST

1. RECORD AND ERASE ALL THEFT AND SECURITY SYSTEM DTC'S

1. With the scan tool, record and erase all DTCs from all theft/security system modules. Monitor for any active codes as you work through the following steps.
 - Review the code monitor and set conditions for any DTCs that are stored and attempt to reproduce the conditions listed
 - Wiggle the wiring harness and connectors of the related circuit, sensor or component
 - Cycle the ignition off. Refer to any Technical Service Bulletins (TSBs) that may apply

Was the source of the customer complaint found or did any DTCs appear and stay active?

Yes

- Make the appropriate repairs and perform the THEFT AND SECURITY SYSTEM VERIFICATION TEST. Refer to [**THEFT AND SECURITY SYSTEM VERIFICATION TEST**](#) .
- For DTC procedures. Refer to [**DIAGNOSIS AND TESTING**](#) .

No

- Go To [**2**](#)

2. ATTEMPT TO REPRODUCE THE CONDITION

1. In the event the customer complaint cannot be duplicated due to an intermittent condition in the theft/security system, the following may aid in attempting to reproduce the condition.
 - Using the wiring diagram/schematic as a guide, inspect the wiring and connectors related to the stored code or component in question.
 - Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.
 - If the customer concern was related to a specific FOB/K, ensure the FOB/K in question is used while attempting reproduce the condition.
 - Reconnect any disconnected components and harness connectors and ensure they are properly seated.
 - If numerous trouble codes were set check for any aftermarket accessories installed; and if the concern happens in a specific area, use a schematic and inspect any common ground or supply circuits

Was the source of the intermittent condition located?

Yes

- Make the appropriate repairs and perform the THEFT AND SECURITY SYSTEM VERIFICATION PROCEDURE. Refer to [**STANDARD PROCEDURE**](#).

No

- The problem cannot be found at this time. If repeated intermittent failures are encountered that cannot be reproduced and the condition has prompted multiple customer visits to the dealership, document any findings on the repair order.

THEFT AND SECURITY SYSTEM VERIFICATION TEST

DIAGNOSTIC TEST

1. DETERMINE REQUIRED PROGRAMMING AND SET UP

NOTE: Due the numerous functions performed by the Radio Frequency Hub (RF Hub) it is essential to follow all instructions carefully and be aware of the effects this module has on the Theft and Security and Remote Keyless Entry (RKE) subsystems. Service replacement will also affect a customers personalization settings.

Was the Radio Frequency Hub replaced?

Yes

- Perform the RADIO FREQUENCY HUB VERIFICATION TEST. Refer to [**RADIO FREQUENCY \(RF HUB\) VERIFICATION TEST**](#) .

No

- Go To [**2**](#)

2. RF HUB REPAIR VERIFICATION

1. Reconnect the previously disconnected components and connectors.
2. Connect the scan tool to the Data Link Connector - use the most current software available.
3. With the scan tool, erase stored DTCs in the RF Hub module.
4. Cycle the ignition off, and wait 15 seconds, then cycle the ignition on. If the customer complaint was due to a specific FOB/IK, use the suspect FOB/IK.
5. Exercise the Theft and Security System to duplicate the appropriate monitor conditions for any DTCs that were set
6. Wait one minute, and read the active codes.

Are any DTCs present or, is the original condition still present?

Yes

- For DTC Diagnostics. Refer to [**DIAGNOSIS AND TESTING**](#) .
- For Symptom Diagnostics. Refer to [**DIAGNOSIS AND TESTING**](#) .

No

- Repair is complete.

RADIO FREQUENCY (RF HUB) VERIFICATION TEST

NOTE: If other electronic modules need to be replaced, besides the RF-Hub, see the "Replacement and Programming Order Guide" before proceeding. Refer to [**STANDARD PROCEDURE**](#) .

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

Perform the following after completion of a diagnostic repair:

VERIFICATION TEST

1. Reconnect the previously disconnected components and connectors.
2. It may be necessary to obtain the vehicle's unique Personal Identification Number (PIN) assigned to the vehicle. This number can be obtained from the original vehicle invoice or from your Service Manager or Parts Manager.

NOTE: If, during programming, the scan tool instructs to "Enter the vehicle PIN number", care should be taken because the Radio Frequency Hub Module

(RFHM) will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PIN's are entered, the RFHM will Lock Out the scan tool. To exit Lock Mode, the ignition must remain in the On position for 25 minutes. All accessories must be off. A battery charger connected to the battery during this time period is recommended.

NOTE: The Body Control Module (BCM) stores the secret key information. When the RFHM needs to be replaced, the secret key information will be retrieved from the BCM and then transferred to the new RFHM for security use.

NOTE: If the BCM is also being replaced at this time, refer to the RFHM, BCM, FOBIC Replacement and Programming Guide and follow the proper order before proceeding. Refer to [STANDARD PROCEDURE](#) .

3. Turn the ignition on.

4. With the scan tool select the RFHM.

NOTE: If the scan tool displays a message indicating a "Configuration issue" press "Continue" and follow the directions on the scan tool.

5. Turn the ignition off.

6. If the RFHM was replaced or any un-programmed or new FOBICs, program all FOBICs that are to be used with this vehicle. With the scan tool, select "Misc. Functions", "Program Ignition FOBICs" and follow the instructions on the screen.

NOTE: All FOBICs that are to be used in this vehicle must remain on the front seat near the console during programming.

NOTE: If the RFHM is being replaced with a new unit, a diagnostic scan tool **MUST** be used to configure data into the new ECU. Follow the routine outlined in the diagnostic scan tool for Restore Vehicle Configuration under Body Control Module (BCM) Miscellaneous Functions menu.

7. If the RFHM module was replaced, with the scan tool select "RFHM", "Misc. Functions", "RFHM Replace" and follow the instructions on the screen.

8. Turn the ignition on then off leaving the key in the On position.

9. With the scan tool, erase all RFHM DTCs.

10. Operate all equipped RFHM functions (Passive Entry, Remote Start, Ignition Positions etc.).

11. Wait four minutes.

12. With the scan tool, read the RFHM DTCs.

Are there any RFHM DTCs present or any RFHM functions not operating properly?

Yes

- Repair not complete, and perform the appropriate diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#) .

No

- Repair is complete.
-

2021 ACCESSORIES AND EQUIPMENT

(Right Blind Spot Module Sensor (BSM) (RBSS) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>B2199-16</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
<u>B2199-17</u>	BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
<u>B21DD-84</u>	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
<u>B21DD-85</u>	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
<u>B222C-00</u>	VEHICLE CONFIGURATION NOT PROGRAMMED
<u>B223B-00</u>	VEHICLE CONFIGURATION MISMATCH
<u>B22A9-04</u>	ECU INTERNAL PERFORMANCE - SYSTEM INTERNAL FAILURES
<u>B22A9-45</u>	ECU INTERNAL PERFORMANCE-PROGRAM MEMORY FAILURE
<u>B285F-11</u>	BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO GROUND
<u>B285F-15</u>	BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO BATTERY OR OPEN
<u>U0011-00</u>	CAN INTERIOR BUS OFF PERFORMANCE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U11FB-00</u>	LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR

DIAGNOSIS AND TESTING

B2199-16-BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

Continuously runs when the following condition is met:

- With the Ignition in run position.

SET CONDITION

- The module detects that the battery supply voltage is less than 8.0 volts

Default Action:

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM
FUSED IGNITION OUTPUT CIRCUIT EXCESSIVE RESISTANCE
GROUND CIRCUIT EXCESSIVE RESISTANCE
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE (F923) FUSED IGNITION OUTPUT (RUN) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

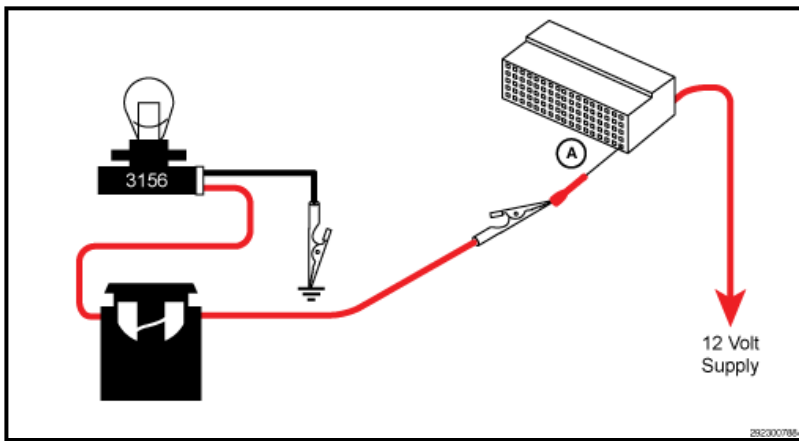
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK THE (Z926) GROUND CIRCUIT FOR OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

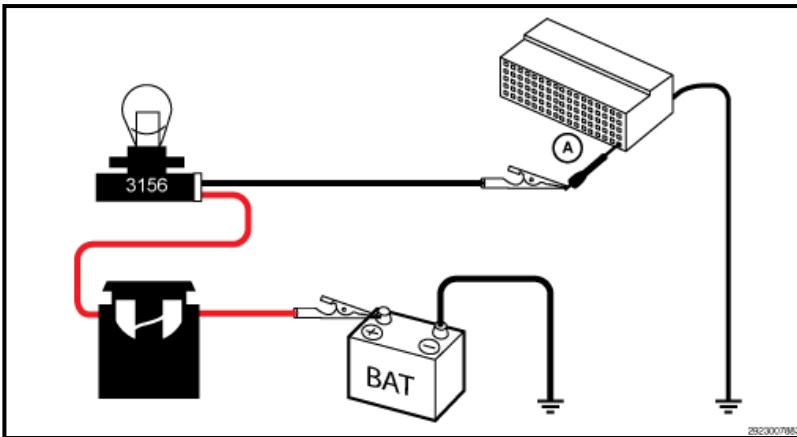
NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

**NOTE:**

When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RBSS DTCs.

Did the DTC return?

Yes

- Replace the RBSS in accordance with the Service information. Refer to [**SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

B2199-17-BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Right Blind Spot Sensor (RBSS) supply voltage is greater than 16.0 volts.

Default Action:

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
VEHICLE CHARGING SYSTEM RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING SYSTEM RELATED DTCS IN THE POWERTRAIN CONTROL MODULE (PCM)

1. Verify the Battery is in good condition. and perform the Battery System diagnostic procedure. Refer to **DIAGNOSIS AND TESTING** , or **DIAGNOSIS AND TESTING** .
2. With the scan tool in ECU View, select PCM and check for any Charging System related DTCS.

Does the scan tool display any Charging System related DTCS?

Yes

- Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) and perform the appropriate charging system or battery DTC diagnostic procedure.

No

- Replace the RBSS in accordance with the Service information. Refer to [MODULE, BLIND SPOT \(BSM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- The Ignition is in on position.

SET CONDITION

- When the Body Control Module (BCM) broadcasts a CAN IHS message that the System Voltage that is less than 10 volts.

Default Action:

- Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) VOLTAGE RELATED DTC'S
VOLTAGE RELATED DTCS SET IN OTHER MODULES
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BCM CHARGING SYSTEM CODES

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system BCM DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go to [3](#)

3. CHECK FOR VOLTAGE RELATED DTCS IN ALL MODULES

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. Check for DTC's in all modules.

Are there any voltage related DTCs set in other modules?

Yes

- Perform the appropriate diagnostic procedure.

No

- Replace RBSS in accordance with the Service information.

Refer to [MODULE, BLIND SPOT \(BSM\), REMOVAL AND INSTALLATION](#) .

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- The Ignition is in on position.

SET CONDITION

- The Body Control Module (BCM) broadcasts a CAN IHS message that the System Voltage that is greater than 16 volts.

Default Action:

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) VOLTAGE RELATED DTC'S
VOLTAGE RELATED DTCS SET IN OTHER MODULES
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BCM CHARGING SYSTEM CODES

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Make sure the battery is fully charged.

Are any charging system BCM DTCs present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Go to [3](#)

3. CHECK FOR VOLTAGE RELATED DTCS IN ALL MODULES

1. With the scan tool, read DTCs in all ECUs and record on the repair order.
2. Check for DTC's in all modules.

Are there any voltage related DTCs set in other modules?

Yes

- Perform the appropriate diagnostic procedure.

No

- Replace RBSS in accordance with the Service information.

Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B222C-00-VEHICLE CONFIGURATION NOT PROGRAMMED

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Right Blind Spot Sensor (RBSS) receives a CAN-IHS bus vehicle configuration message from the BCM.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
VEHICLE CONFIGURATION IN THE RIGHT BLIND SPOT SENSOR (RBSS)
VEHICLE CONFIGURATION IN THE BODY CONTROL MODULE (BCM)
INCORRECT BCM HARDWARE OR SOFTWARE PART NUMBER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CONFIGURE THE BCM

1. With the scan tool, perform the Vehicle Configuration routine.
2. With the scan tool, erase DTCs.
3. Cycle the ignition switch from off to on at least five times.
4. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. CHECK THE BCM HARDWARE AND SOFTWARE PART NUMBERS

1. With the scan tool, look at the BCM hardware and software part numbers and record on the repair order.

Are the BCM hardware and software part numbers correct for the vehicle?

Yes

- Test complete.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Replace the BCM in accordance with the service information. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

B223B-00-VEHICLE CONFIGURATION MISMATCH

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Right Blind Spot Sensor (RBSS) detects an incorrect vehicle configuration.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
RIGHT BLIND SPOT SENSOR (RBSS) RECEIVED THE WRONG VEHICLE CONFIGURATION INFORMATION
BODY CONTROL MODULE (BCM) NOT PROGRAMMED FOR THIS VEHICLE
INCORRECT (BCM) HARDWARE OR SOFTWARE PART NUMBER
INCORRECT LEFT BLIND SPOT SENSOR (LBSS) PART NUMBER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK BCM VEHICLE CONFIGURATION

1. With the scan tool, confirm vehicle Model is JT.
2. With the scan tool, confirm, Country Code not SNA.

3. With the scan tool, confirm vehicle Model in range of 2018 to 2063.

Are any configurations incorrect?

Yes

- Go To [4](#)

No

- Go To [3](#)

3. CHECK FOR BCM CORRECT HARDWARE

1. Access BCM. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .

2. Confirm correct part number.

Is it the correct part number?

Yes

- Go To [5](#)

No

- Replace BCM in accordance with the Service information. Refer to **MODULE, BODY CONTROL (BCM), REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK FOR CORRECT RBSS

1. Access RBSS. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .

NOTE: Do Not Change if the part is not the latest part level, just confirm that it is a Wrangler part.

2. Confirm correct part number.

Is it the correct part number?

Yes

- Go To [5](#)

No

- Replace RBSS. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. RESET BCM VEHICLE CONFIGURATION

1. With the scan tool, restore BCM vehicle configuration.

2. With the scan tool, erase all DTCs.

3. Turn the ignition off for a minimum of 10.0 seconds.

4. Turn the ignition on.

5. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Test complete.

B22A9-04-ECU INTERNAL PERFORMANCE - SYSTEM INTERNAL FAILURES

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Right Blind Spot Sensor (RBSS) detects an internal hardware failure.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the RBSS in accordance with the Service Information. Refer to [MODULE, BLIND SPOT \(BSM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B22A9-45-ECU INTERNAL PERFORMANCE-PROGRAM MEMORY FAILURE

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition on.

SET CONDITION

- The Right Blind Spot Sensor (RBSS) detects an internal software failure.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.
- Mirror LED will illuminate.

POSSIBLE CAUSES

Possible Causes
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the RBSS in accordance with the Service Information. Refer to **MODULE, BLIND SPOT (BSM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B285F-11-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO GROUND

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- Ignition on in the run position.
- The Blind Spot Indicator is turned on.

NOTE: **The Blind Spot Indicator is turned on continuously for a minimum of 2 seconds while the vehicle is driven above 6 mph during an active Blind Spot Alert.**

SET CONDITION

- The Right Blind Spot Sensor (RBSS) detects the Blind Spot Indicator circuit is shorted to ground.

DEFAULT ACTION

- Display Blind Spot System Temporarily Unavailable.

POSSIBLE CAUSES

Possible Causes
RIGHT BLIND SPOT INDICATOR DRIVER CIRCUIT SHORT TO GROUND
RIGHT BLIND SPOT INDICATOR DRIVER CIRCUIT SHORT TO ANOTHER CIRCUIT
RIGHT BLIND SPOT INDICATOR
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR MODULE SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE:

In order for this DTC test to be completed, the LED in the Passenger Door Mirror must be on for a minimum of 2 seconds. There is an RBSS IO control routine to that allows a test tool to turn on and off the LED. An alternate method is to drive the vehicle with an active blind spot alert on the passenger side of the vehicle for longer than 2 seconds.

1.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

3. ISOLATE AND CHECK THE (P712) RIGHT BLIND SPOT SENSOR INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P712) RBSS INDICATOR DRIVER CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RBSS HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [5](#)

5. DISCONNECT THE MIRROR HARNESS CONNECTOR AND VERIFY THE ABILITY OF THE RBSS TO READ THE CONTROL CIRCUIT OPEN OR SHORT TO BATTERY DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. With the ignition in the off position, disconnect the component harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

Does the scan tool display the CONTROL CIRCUIT OPEN OR SHORT TO BATTERY DTC with the connector disconnected?

Yes

- Replace the Right Blind Spot Indicator in accordance with the Service Information. Refer to [MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED RBSS AND COMPONENT CONNECTIONS

1. Disconnect all RBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RBSS DTCs.

Did the DTC return?

Yes

- Replace and program the Right Blind Spot Sensor (RBSS) in accordance with the Service Information. Refer to [SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- The wiring or poor connection has been repaired
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

B285F-15-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO BATTERY OR OPEN

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Blind Spot Monitor (BSM) system used in this vehicle has two control modules. One control module is dedicated to each side of the vehicle. If the sensor detects a vehicle in the blind spot path, the module will send a driver signal to the corresponding mirror LED blind spot warning light. The Module monitors itself for any internal failures, CAN bus communication concerns, battery, system voltage, and any vehicle configuration concerns.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- Ignition on in run position.
- The Blind Spot Indicator is turned off.

NOTE: The maturation of this DTC is 10 seconds due to a possible false setting of the DTC if the Doors are removed.

SET CONDITION

- The Right Blind Spot Sensor (RBSS) detects the Blind Spot Indicator circuit is shorted to voltage or open.

DEFAULT ACTION

- Display Blind Spot System Temporarily Unavailable.

POSSIBLE CAUSES

Possible Causes
RIGHT MIRROR DISCONNECTED
RIGHT BLIND SPOT INDICATOR DRIVER CIRCUIT SHORTED TO VOLTAGE
RIGHT BLIND SPOT INDICATOR DRIVER CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT BLIND SPOT INDICATOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT BLIND SPOT INDICATOR
RIGHT BLIND SPOT SENSOR (RBSS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR MODULE SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.

- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

NOTE: **The maturation of this DTC is 10 seconds due to possible false setting of the DTC if the Doors are removed.**

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#) .

3. CHECK THE RIGHT REAR BLIND SPOT SENSOR AND PASSENGER MIRROR HARNESS CONNECTORS AND TERMINALS

1. Turn the ignition off.
2. Check the Right Rear Blind Spot Sensor harness connector for proper connection at the Right Rear Blind Spot Sensor.
3. Check the Passenger Mirror harness connector for proper connection at the Passenger Mirror.
4. Verify that the connectors are completely plugged in and locked prior to disconnecting.
5. Disconnect the Right Rear Blind Spot Sensor harness connector and check for pushed out or spread terminals, brinelling on terminals, discoloration from excessive heat, or corrosion and water intrusion.
6. Disconnect the Passenger Mirror harness connector and check for pushed out or spread terminals, brinelling on terminals, discoloration from excessive heat, or corrosion and water intrusion.

Were any issues found with the connector or terminals?

Yes

- Repair the found issues in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (P712) RBSS INDICATOR DRIVER CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE RBSS HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [STANDARD PROCEDURE](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (P712) RIGHT BLIND SPOT SENSOR INDICATOR DRIVER CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an ECU harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

6. CHECK THE BLIND SPOT INDICATOR (Z910) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

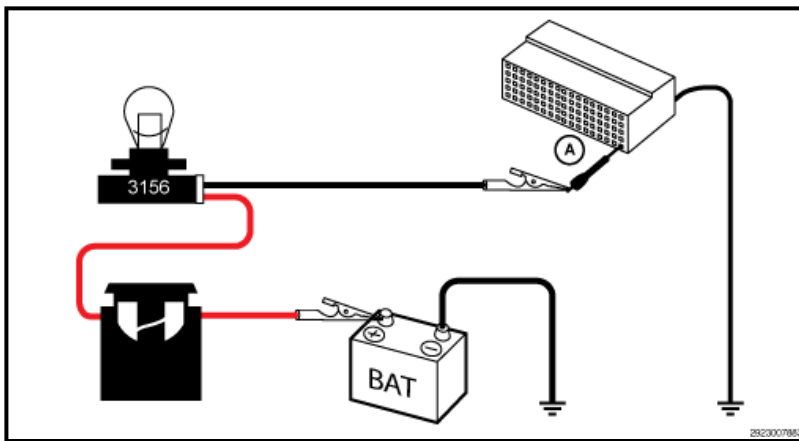
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [7](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

7. CONNECT A FUSED JUMPER BETWEEN THE (P712) RBSS SIGNAL CIRCUIT AND THE (Z910) SENSOR GROUND CIRCUIT AT THE MIRROR HARNESS CONNECTOR - VERIFY ABILITY OF THE RBSS TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The ECU harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.

NOTE: The maturation of this DTC is 10 seconds due to possible false setting of the DTC if the Doors are removed.

5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Does the scan tool display the B285F-11-BLIND SPOT WARNING LIGHT CONTROL - CIRCUIT SHORT TO GROUND DTC with the jumper in place?

Yes

- Replace the Right Blind Spot Indicator in accordance with the Service Information. Refer to [MIRROR, OUTSIDE REARVIEW, REMOVAL AND INSTALLATION MIRROR, OUTSIDE REARVIEW, GLASS, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK RELATED RBSS AND COMPONENT CONNECTIONS

1. Disconnect all RBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RBSS DTCs.

Did the DTC return?

Yes

- Replace and program the Right Blind Spot Sensor (RBSS) in accordance with the Service Information. Refer to [**SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION**](#) .
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

No

- The wiring or poor connection has been repaired
- Perform the BODY VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#) .

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to [**BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX**](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U11FB-00-LOST COMMUNICATION WITH LEFT BLIND SPOT SENSOR

For a complete BLIND SPOT MONITOR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- No BUS messages from the Left Blind Spot Sensor (LBSS) are received for greater than 1.05 seconds.

DEFAULT ACTION

- The Electronic Vehicle Information Center (EVIC) will display BLIND SPOT SYSTEM TEMPORARILY UNAVAILABLE.

POSSIBLE CAUSES

Possible Causes
FUSED RUN RELAY CONTROL CIRCUIT OPEN
GROUND CIRCUIT OPEN
CAN IHS BUS CIRCUITS OPEN
LEFT BLIND SPOT SENSOR (LBSS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read RBSS DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE LBSS (F923) FUSED RUN RELAY CONTROL CIRCUIT FOR AN OPEN

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. ISOLATE AND CHECK THE (Z925) LBSS GROUND CIRCUIT FOR AN OPEN

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. ISOLATE AND CHECK THE (D215) OR (D216) CAN IHS BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all RBSS and LBSS harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all RBSS and LBSS harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read RBSS DTCs.

Did the DTC return?

Yes

- Replace the LBSS in accordance with the Service Information. Refer to **SENSOR, BLIND SPOT, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
 - Test complete.
-

2021 GENERAL INFORMATION

(Security Gateway Module (SGW) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B2199-14	BATTERY VOLTAGE-CIRCUIT SHORT TO GROUND OR OPEN
B2199-16	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
0	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
B2199-17	
B22A9-49	ECU INTERNAL PERFORMANCE-INTERNAL ELECTRONIC FAILURE
B235A-00	ECU IN-PLANT MODE
C221C-00	ECU FLASH REQUIRED
U0001-00	CAN C BUS
U0002-00	CAN C BUS OFF PERFORMANCE
U0011-00	CAN INTERIOR BUS OFF PERFORMANCE
U0019-00	CAN B BUS
U0020-00	CAN B BUS OFF PERFORMANCE

DIAGNOSIS AND TESTING

B2199-14-BATTERY VOLTAGE-CIRCUIT SHORT TO GROUND OR OPEN

For a complete CAN IHS BUS SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Security Gateway Module (SGW) provides security against certain types of attacks and threats from the scan tool and entertainment CAN Bus to the rest of vehicle's CAN Bus Modules. The SGW lies electrically between the vehicle modules on one side, Data Link Connector (DLC) and entertainment system modules on the other side. The main function of the SGW is to gate messages from one CAN Bus system to another. The SGW monitors the Fused B+, CAN Bus performance related faults, software and hardware for any concerns. The SGW does **NOT** monitor the CAN C Diagnostic or CAN IHS Diagnostic circuits for concerns.

Successful communication with the vehicle is established thru the CAN C Diagnostic (+) and CAN C Diagnostic (-) circuits with the Diagnostic Scan Tool from the SGW.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition in the Run position.

SET CONDITION

- When the ignition is on and the Security Gateway Module (SGW) has detected an open on the Fused B+ circuit.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes

FUSED B (+) CIRCUIT FUSE OPEN
FUSED B (+) CIRCUIT OPEN
FUSED B (+) CIRCUIT SHORTED TO GROUND
SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE (A902) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE:

Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load

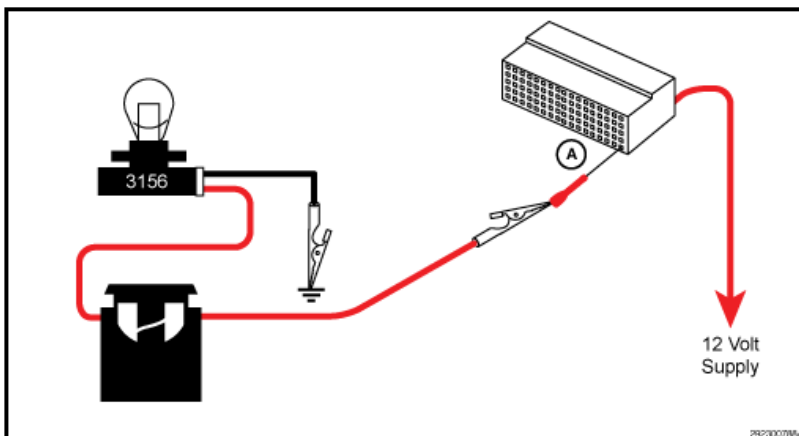
testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the circuit is open due to a open Fused B+ circuit fuse, Go To [3](#)
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (A902) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Security Gateway Module (SGW) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SGW DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete CAN C BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

For a complete CAN IHS BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Security Gateway Module (SGW) provides security against certain types of attacks and threats from the scan tool and entertainment CAN Bus to the rest of vehicle's CAN Bus Modules. The SGW lies electrically between the vehicle modules on one side, Data Link Connector (DLC) and entertainment system modules on the other side. The main function of the SGW is to gate messages from one CAN Bus system to another. The SGW monitors the Fused B+, CAN Bus performance related faults, software and hardware for any concerns. The SGW does **NOT** monitor the CAN C Diagnostic or CAN IHS Diagnostic circuits for concerns.

Successful communication with the vehicle is established thru the CAN C Diagnostic (+) and CAN C Diagnostic (-) circuits with the Diagnostic Scan Tool from the SGW.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition in the RUN position.

SET CONDITION

- When the ignition is on and the Security Gateway Module (SGW) has detected that the Fused B(+) circuit or the Ignition Run/Start circuit is less than 10.0 volts.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes

CHARGING SYSTEM LOW
FUSED B(+) CIRCUIT HIGH RESISTANCE
IGNITION RUN/START CIRCUIT HIGH RESISTANCE
GROUND CIRCUIT HIGH RESISTANCE
SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK POWERTRAIN DTCS

NOTE: Verify that the battery is fully charged with a DVOM and use the scan tool to compare the Battery Voltage listed under "Data" in the Security Gateway Module (SGW) and compare battery voltage data in the PCM. If the battery is not fully charged, correct this condition before proceeding.

1. With the scan tool, read the active PCM DTCS.

Are there any Battery or Charging System DTCS?

Yes

- Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** and perform the appropriate diagnostic procedure for the charging system DTCS.

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

3. CHECK THE (A902) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

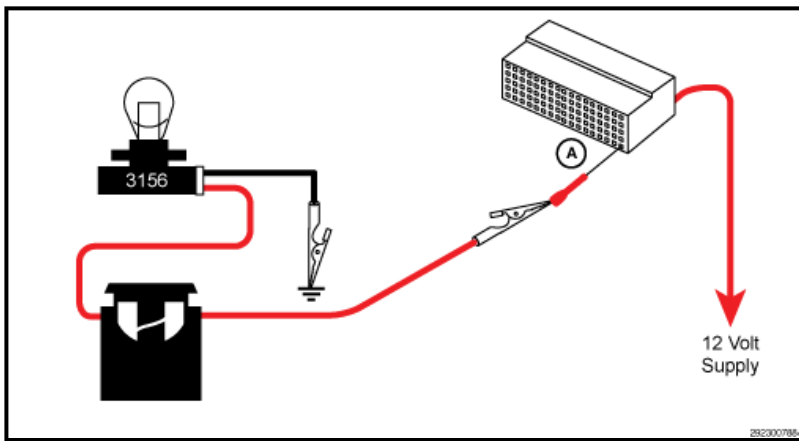
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- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
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NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK THE (F949) IGNITION RUN/START CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit.

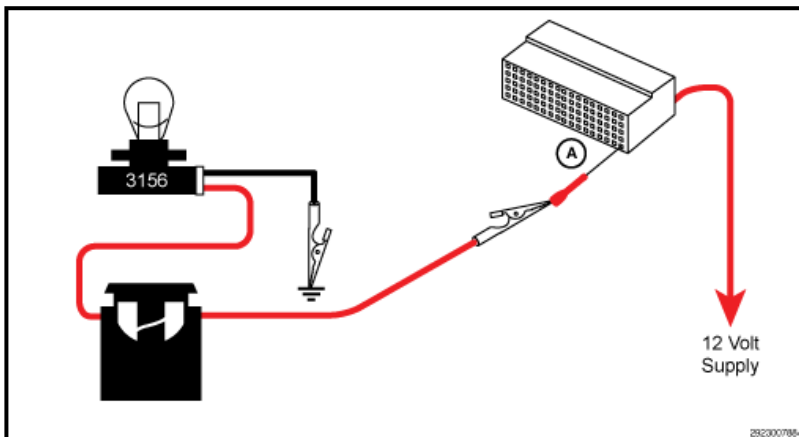
Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

5. CHECK THE TWO (Z912) GROUND CIRCUITS FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUITS

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

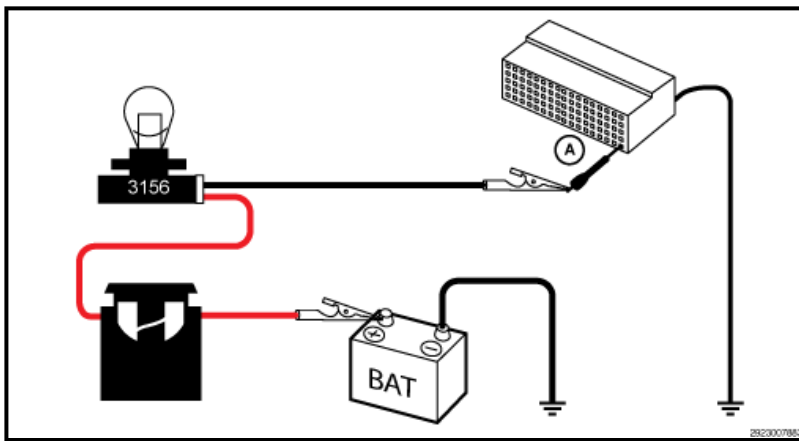
NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



Is the load test bulb illuminated and bright?

- Go To [6](#)

- Repair the ground circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

1. Disconnect all Security Gateway Module (SGW) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read Security Gateway Module (SGW) DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

THEORY OF OPERATION

The Security Gateway Module (SGW) provides security against certain types of attacks and threats from the scan tool and entertainment CAN Bus to the rest of vehicle's CAN Bus Modules. The SGW lies electrically between the vehicle modules on one side, Data Link Connector (DLC) and entertainment system modules on the other side. The main function of the SGW is to gate messages from one CAN Bus system to another. The SGW monitors the Fused B+, CAN Bus performance related faults, software and hardware for any concerns. The SGW does **NOT** monitor the CAN C Diagnostic or CAN IHS Diagnostic circuits for concerns.

Successful communication with the vehicle is established thru the CAN C Diagnostic (+) and CAN C Diagnostic (-) circuits with the Diagnostic Scan Tool from the SGW.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- All ignition positions and module is awake.
- Battery voltage must be at least 16.0 volts but no higher than 20.0 volts for this fault to set.

SET CONDITION

- Anytime the Security Gateway Module (SGW) detects voltage input above 16.0 volts.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes
HIGH VOLTAGE PCM DTC
SECURITY GATEWAY MODULE (SGW)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK POWERTRAIN DTCS

1. Verify that the battery is not overcharged with a DVOM.
2. Verify that the battery is fully charged with a DVOM and use the scan tool to compare the Battery Voltage listed under "Data" in the Security Gateway Module (SGW) and compare battery voltage data in the PCM. If the battery is overcharged, correct this condition before proceeding.
3. With the scan tool, read PCM DTCs and record on the repair order.

Are there any active Battery or Charging system DTCs present?

Yes

- Repair PCM DTC(s) in accordance with Service Information. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)

2. CHECK THE SECURITY GATEWAY MODULE (SGW)

1. With the scan tool, read Security Gateway Module (SGW) DTCs and record on the repair order.
2. Start the engine and run for two minutes.
3. With the scan tool, read Security Gateway Module (SGW) DTCs.

Is the DTC active?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to [MODULE, SECURITY GATEWAY \(SGW\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

B22A9-49-ECU INTERNAL PERFORMANCE-INTERNAL ELECTRONIC FAILURE

THEORY OF OPERATION

The Security Gateway Module (SGW) provides security against certain types of attacks and threats from the scan tool and entertainment CAN Bus to the rest of vehicle's CAN Bus Modules. The SGW lies electrically between the vehicle modules on one side, Data Link Connector (DLC) and entertainment system modules on the other side. The main function of the SGW is to gate messages from one CAN Bus system to another. The SGW monitors the Fused B+, CAN Bus performance related faults, software and hardware for any concerns. The SGW does **NOT** monitor the CAN C Diagnostic or CAN IHS Diagnostic circuits for concerns.

Successful communication with the vehicle is established thru the CAN C Diagnostic (+) and CAN C Diagnostic (-) circuits with the Diagnostic Scan Tool from the SGW.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On.
- Power supply is greater than 10.0 volts and less than 16.0 volts.

SET CONDITION

- The Security Gateway Module (SGW) detects an internal hardware failure.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes
SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

B235A-00-ECU IN-PLANT MODE

THEORY OF OPERATION

The Security Gateway Module (SGW) has three calibration files (flashes), default (blank-new module), Assembly (fully communicating without authentication only in assembly plant), Customer (Secured data that requires authentication).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On.
- Power supply is greater than 10.0 volts and less than 16.0 volts.

SET CONDITION

- The Security Gateway Module (SGW) detects that the module is in in-plant mode.

DEFAULT ACTION

- No default actions.

POSSIBLE CAUSES

Possible Causes
SECURITY GATEWAY MODULE (SGW) REQUIRES FLASH PROGRAMMING
SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), MODULE PROGRAMMING** .
- If programming attempts of the Security Gateway Module (SGW) is unsuccessful, replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

C221C-00-ECU FLASH REQUIRED

THEORY OF OPERATION

The Security Gateway Module (SGW) provides security against certain types of attacks and threats from the scan tool and entertainment CAN Bus to the rest of vehicle's CAN Bus Modules. The SGW lies electrically between the vehicle modules on one side, Data Link Connector (DLC) and entertainment system modules on the other side. The main function of the SGW is to gate messages from one CAN Bus system to another. The SGW monitors the Fused B+, CAN Bus performance related faults, software and hardware for any concerns. The SGW does **NOT** monitor the CAN C Diagnostic or CAN IHS Diagnostic circuits for concerns.

Successful communication with the vehicle is established thru the CAN C Diagnostic (+) and CAN C Diagnostic (-) circuits with the Diagnostic Scan Tool from the SGW.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition On.
- Power supply is greater than 10.0 volts and less than 16.0 volts.

SET CONDITION

- The Security Gateway Module (SGW) detects that the module is in bootloader mode and has not been flashed programmed.
- This DTC will set after a Security Gateway Module (SGW) is replaced.

DEFAULT ACTION

- Radio functions and audio are completely inoperative.

POSSIBLE CAUSES

Possible Causes
SECURITY GATEWAY MODULE (SGW) REQUIRES FLASH PROGRAMMING

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), MODULE PROGRAMMING** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

U0001-00-CAN C BUS

For a complete CAN C BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position.
- Battery voltage is between 10.0 and 16.0 volts for at least 5 seconds.

SET CONDITION

- CAN C bus or CAN C A/T bus has experienced a failure due to a circuit or processor fault.

DEFAULT ACTION

- Radio functions and audio may be inoperative.
- Vehicle will not start if the CAN C bus is open or shorted.

POSSIBLE CAUSES

Possible Causes
OPEN OR SHORTED CAN C BUS CIRCUIT OPEN OR SHORTED CAN C A/T BUS CIRCUIT CAN C RELATED MODULE CAN C RELATED STAR CONNECTOR SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE NETWORK TOPOLOGY OF THE CAN C BUS WITH THE SCAN TOOL

1. With the scan tool, view the network topology.

Are all of the modules present on the CAN C bus?

Yes

- Go To [3](#)

No

- Using the appropriate wiring diagrams as a guide and the CAN C Star connectors, isolate the CAN C bus problem for opens, shorts or a faulty module on the CAN C Bus.
- For further operation of the CAN bus system. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

3. CHECK THE NETWORK TOPOLOGY OF THE CAN C A/T BUS WITH THE SCAN TOOL

1. With the scan tool, view the network topology.

Is the Radio present on the CAN C A/T bus?

Yes

- Go To [4](#)

No

- Check that the correct Radio (sales code) is installed in the vehicle and the correct flash part number of the SGW is correct. If ok, use the wiring diagrams as a guide, and isolate the CAN C A/T bus problem for opens or shorts.
- For further operation of the CAN bus system. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#).
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Security Gateway Module (SGW) harness connectors.

2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SGW DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0002-00-CAN C BUS OFF PERFORMANCE

For a complete CAN C BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position.
- Battery voltage is between 10.0 and 16.0 volts for at least 5 seconds.

SET CONDITION

- CAN C bus or CAN C A/T bus has experienced a failure due to a circuit or processor fault.

DEFAULT ACTION

- Radio functions and audio may be inoperative.
- Vehicle will not start if the CAN C bus is open or shorted.

POSSIBLE CAUSES

Possible Causes
OPEN OR SHORTED CAN C BUS CIRCUIT
OPEN OR SHORTED CAN C A/T BUS CIRCUIT
CAN C RELATED MODULE
CAN C RELATED STAR CONNECTOR
SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE NETWORK TOPOLOGY OF THE CAN C BUS WITH THE SCAN TOOL

1. With the scan tool, view the network topology.

Are all of the modules present on the CAN C bus?

Yes

- Go To [3](#)

No

- Using the appropriate wiring diagrams as a guide and the CAN C Star connectors, isolate the CAN C bus problem for opens, shorts or a faulty module on the CAN C Bus.
- For further operation of the CAN bus system. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE NETWORK TOPOLOGY OF THE CAN C A/T BUS WITH THE SCAN TOOL

1. With the scan tool, view the network topology.

Is the Radio present on the CAN C A/T bus?

Yes

- Go To [4](#)

No

- Check that the correct Radio (sales code) is installed in the vehicle and the correct flash part number of the SGW is correct. If ok, use the wiring diagrams as a guide, and isolate the CAN C A/T bus problem for opens or shorts.
- For further operation of the CAN bus system. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#) .

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Security Gateway Module (SGW) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SGW DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

For a complete CAN IHS BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position.
- Battery voltage is between 10.0 and 16.0 volts for at least 5 seconds.

SET CONDITION

- CAN IHS Bus or CAN IHS A/T Bus has experienced a failure due to a circuit or processor fault.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes
OPEN OR SHORTED CAN IHS BUS CIRCUIT OPEN OR SHORTED CAN IHS A/T BUS CIRCUIT CAN IHS RELATED MODULE CAN IHS RELATED STAR CONNECTOR SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK THE NETWORK TOPOLOGY OF THE CAN IHS BUS WITH THE SCAN TOOL

1. With the scan tool, view the network topology.

Are all of the modules present on the CAN IHS bus?

Yes

- Go To [3](#)

No

- Using the appropriate wiring diagrams as a guide and the CAN IHS Star connectors, isolate the CAN IHS Bus problem for opens, shorts or a faulty module on the CAN IHS Bus.
- For further operation of the CAN bus system. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. CHECK THE NETWORK TOPOLOGY OF THE CAN IHS A/T BUS WITH THE SCAN TOOL

1. With the scan tool, view the network topology.

Is the Radio present on the CAN IHS A/T bus?

Yes

- Go To [4](#)

No

- Using the appropriate wiring diagrams as a guide, isolate the CAN IHS A/T bus problem for opens or shorts.
- For further operation of the CAN bus system. Refer to [COMMUNICATION, DESCRIPTION AND OPERATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Security Gateway Module (SGW) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SGW DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

U0019-00- CAN B BUS

For a complete CAN IHS BUS SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position.
- Battery voltage is between 9.0 and 16.0 volts for at least 5 seconds.

SET CONDITION

- CAN bus has experienced a failure due to a circuit or processor fault.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes
OPEN OR SHORTED CAN BUS CIRCUIT CAN RELATED MODULE CAN RELATED STAR CONNECTOR (IF EQUIPPED) SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DETERMINE THE SPECIFIC CAN BUS AFFECTED WITH THE SCAN TOOL

NOTE: It is possible for an ECU that is connected to multiple, individually separated CANs to be communicating on only one single CAN.

- The SGW is connected to multiple, individually separated interior CANs.
- The radio is connected to a chassis and interior CAN.

1. With the scan tool, view the network topology and determine the specific CAN bus affected with the scan tool.
2. With the scan tool, confirm the correct radio by part number is in this vehicle. If the incorrect radio is in this vehicle, replace the radio according to Service Information with the correct radio before proceeding with this diagnostic test.
 - Go To [3](#)

3. CHECK THE NETWORK TOPOLOGY OF THE RELATED CAN BUS WITH THE SCAN TOOL

NOTE: It is possible for an ECU that is connected to multiple, individually separated CANs to be communicating on only one single CAN.

- The SGW is connected to multiple, individually separated interior CANs.
- The radio is connected to a chassis and interior CAN.

1. With the scan tool, view the network topology.

Are all of the modules present on the related CAN bus?

Yes

- Go To [4](#)

No

- Using the appropriate wiring diagrams as a guide and the CAN Star connectors (if equipped), isolate the CAN bus problem for opens or shorts.
- For further operation of the CAN bus system refer to - Electrical - Electronic Control Modules / COMMUNICATION / Description and Operation.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Security Gateway Module (SGW) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SGW DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U0020-00-CAN B BUS OFF PERFORMANCE

For a complete CAN IHS BUS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition in the Run position.
- Battery voltage is between 9.0 and 16.0 volts for at least 5 seconds.

SET CONDITION

- CAN bus has experienced a failure due to a circuit or processor fault.

DEFAULT ACTION

- Radio functions and audio may be inoperative.

POSSIBLE CAUSES

Possible Causes
OPEN OR SHORTED CAN BUS CIRCUIT CAN RELATED MODULE CAN RELATED STAR CONNECTOR (IF EQUIPPED) SECURITY GATEWAY MODULE (SGW)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DETERMINE THE SPECIFIC CAN BUS AFFECTED WITH THE SCAN TOOL

NOTE: It is possible for an ECU that is connected to multiple, individually separated CANs to be communicating on only one single CAN.

- The SGW is connected to multiple, individually separated interior CANs.
- The radio is connected to a chassis and interior CAN.

1. With the scan tool, view the network topology and determine the specific CAN bus affected with the scan tool.
2. With the scan tool, confirm the correct radio by part number is in this vehicle. If the incorrect radio is in this vehicle, replace the radio according to Service Information with the correct radio before

proceeding with this diagnostic test.

- Go To [3](#)

3. CHECK THE NETWORK TOPOLOGY OF THE RELATED CAN BUS WITH THE SCAN TOOL

NOTE: It is possible for an ECU that is connected to multiple, individually separated CANs to be communicating on only one single CAN.

- The SGW is connected to multiple, individually separated interior CANs.
- The radio is connected to a chassis and interior CAN.

1. With the scan tool, view the network topology.

Are all of the modules present on the related CAN bus?

Yes

- Go To [4](#)

No

- Using the appropriate wiring diagrams as a guide and the CAN Star connectors (if equipped), isolate the CAN bus problem for opens or shorts.
- For further operation of the CAN bus system refer to - Electrical - Electronic Control Modules / COMMUNICATION / Description and Operation.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Security Gateway Module (SGW) harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all Security Gateway Module (SGW) harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Using the recorded Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SGW DTCs.

Did the DTC return?

Yes

- Replace the Security Gateway Module (SGW) in accordance with the Service Information. Refer to **MODULE, SECURITY GATEWAY (SGW), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
 - Test complete.
-

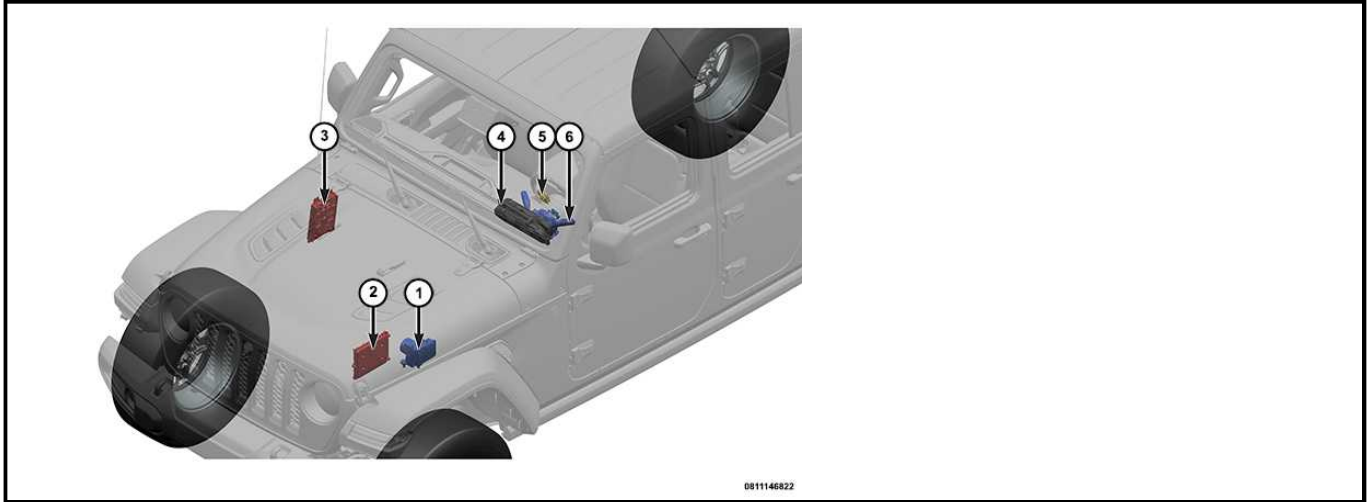
2021 ACCESSORIES AND EQUIPMENT

Speed Control - Service Information - Gladiator

DESCRIPTION AND OPERATION

CONVENTIONAL CRUISE CONTROL

DESCRIPTION



The Cruise Control system is comprised of the following components:

COMPONENT INDEX

1.	Refer to <u>ANTI-LOCK BRAKE SYSTEM (ABS) MODULE</u> .
2.	Refer to <u>POWERTRAIN CONTROL MODULE (PCM)</u> .
3.	Refer to <u>BODY CONTROL MODULE (BCM)</u> .
4.	Refer to <u>INSTRUMENT PANEL CLUSTER (IPC)</u> .
5.	Refer to <u>STEERING COLUMN CONTROL MODULE (SCCM)</u> .
6.	Refer to <u>CRUISE CONTROL SWITCH (CSWC) MODULE</u> - This is the speed control switch pod located on the right steering wheel spoke.
-	Refer to <u>CLUTCH POSITION SENSOR</u> - Manual Transmission (MTX).
-	Refer to <u>TRANSMISSION CONTROL MODULE (TCM)</u> - Integral to the Automatic Transmission (ATX).

OPERATION

Cruise Control

- The driver of the vehicle presses any of the cruise control specific buttons.
- The cruise control switch transmits the request over the Local Interface Network (LIN) bus to the SCCM.
- The SCCM transmits this information over the Controller Area Network-Chassis (CAN-C) bus to the PCM.
- The PCM manages the algorithm in order to keep the vehicle speed set by the driver.

Active Speed Limiter

Active Speed Limiter is a function that allows the driver to set the vehicle speed limit. This function is set by the driver by interfacing with the CSWC button interface. The limiter function is active when the speed of the vehicle is equal to the limitation set point designated by the driver. If the driver exceeds this designated set point, the driver will be warned through audio and visual messages on the IPC. The driver is able to override the limiter function by pressing the accelerator pedal to speed the vehicle beyond the designated set point.

It is important to note that any vehicle driving system utilizing active torque requests (such as braking, traction, or stability events) will take precedence over and inhibit the active speed limiter and cruise control functions. Active speed limiting and cruise control will operate again once the torque request has been honored.

Active speed limiter and Hill Descent Control (HDC) are mutually exclusive and can not be active at the same time.

ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Refer to [**COMPONENT INDEX**](#).

The ABS module is responsible for sending the following signals to the PCM:

Outputs

- Brake pedal activation
- Brake switch rationality
- Vehicle Speed Sensor (VSS) data
- Electronic Stability Control (ESC) state
- Park brake engagement

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

The BCM will gate the status of the cruise control system (ENGAGED or NOT ENGAGED) from the CAN-C to the CAN Interior High Speed (CAN-IHS) data network.

CLUTCH POSITION SENSOR

CLUTCH POSITION SENSOR

Refer to [**COMPONENT INDEX**](#).

The Clutch position sensor is used on vehicles equipped with a MTX. The Clutch Position Sensor receives power and ground from the PCM. The PCM pulses the switch to read the clutch position over a dedicated line between the two components.

CRUISE CONTROL SWITCH (CSWC) MODULE

CRUISE CONTROL SWITCH (CSWC) MODULE

Refer to [**COMPONENT INDEX**](#).

The CSWC module is a push button assembly that consists of five momentary push buttons: (ON/OFF, SET/-, SET/+, RESUME & CANCEL).

- On/Off - This is a momentary button that turns the system ON and OFF.
- SET/- button - This is a momentary switch that has three commands: Set, Tap Down and Decel (-), according to the push button activation mode and cruise control state.
- SET/+ button - This is a momentary switch that has three commands: Set, Tap Up and Accel (+), according to the push button activation mode and cruise control state.
- Resume - This is a momentary switch that allows the driver to re-engage cruise to the last stored vehicle speed, provided that the cruise control system is still enabled and current vehicle speed is greater than the minimum resume speed. When cruise control is disengaged, such that the system is still enabled & a valid set speed is stored, pulse or continuous activation of the Resume button will allow the driver to re-

engage cruise control, resuming to the last stored set speed. Resume will only occur if a set speed has already been established.

- Cancel - This is a momentary switch that allows the driver to place cruise control in a disengaged state, yet keep the system enabled and the set speed stored.

The CSWC module monitors the states of the momentary push buttons (pressed/not pressed) and then transmits this information via the LIN to the SCCM.

If the vehicle is equipped with Engine Stop Start (ESS) system, the CSWC module will not reset during an ESS event. Instead, the CSWC module maintains cruise system functionality for the vehicle operator.

The CSWC receives its power, ground, LIN bus communication, and illumination from the SCCM.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [**COMPONENT INDEX**](#).

The IPC performs three functions in relation to the cruise control system:

1. Cruise control IPC display messages based on the current operating status
2. Cruise control lamp indication based on the current system status
3. Cruise controls "set speed" display according to the customers requested units

Inputs

- Set speed display signals from the PCM
- Multiple cruise control warning and status message requests from the PCM

POWERTRAIN CONTROL MODULE (PCM)

POWERTRAIN CONTROL MODULE (PCM)

Refer to [**COMPONENT INDEX**](#).

The cruise control system and the active speed limiter function are managed by the PCM.

The PCM software continually monitors inputs from the SCCM, ABS module, and the TCM module along with numerous input signals. The PCM strategy then provides the appropriate electronic message outputs and hard wired outputs to operate the requested cruise control features.

The PCM monitors all of the cruise control system electrical circuits to determine the system readiness. If the PCM detects a monitored system fault, it sets and stores a Diagnostic Trouble Code (DTC). The PCM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the CAN network data bus.

Inputs

- Brake pedal activation from the ABS module
- ESC from the ABS module
- Active Speed Limiter input from the SCCM
- Cruise Control inputs from the SCCM. The PCM monitors the CAN-C network every 10ms in order to prevent a missed button press
- VSS signal from the ABS module
- Park brake engagement signal from the ABS module
- Transmission limp mode input from the TCM. ATX only

- Clutch pedal position from the Clutch Position Sensor. Neutral position is detected by lack of correlation between engine and vehicle speed. This is for MTX vehicles only

Outputs

- Outputs to the IPC for message indication
- TCM to request down/up shifting
- State of the cruise control
- Power, ground, and a dedicated signal line to the Clutch Position Sensor

The PCM can inhibit or disengage cruise control when any of the following occur:

- CSWC button latched or stuck
- Brake pedal position or brake switch rationality errors
- Vehicle speed signal is not available
- TCM is in Limp Mode
- ESC fault detected
- Park brake engagement
- Drivetrain Control Module (DTCM) reports a 4low engagement
- Invalid gear engagement detected
- Clutch switch rationality error
- Engine load sensor error (gas only)
- Fuel injection error
- Turbo sensor or actuator error
- Below minimum speed of 30 Kilometer Per Hour (KPH) or 18 Miles Per Hour (MPH)
- Engine Revolution Per Minute (RPM) is too high or reported as too high
- Throttle body actuator or sensor errors
- Accelerator Pedal Position Sensor (APPS) errors or errors in the accelerator pedal potentiometer.

The conditions that can turn off ASL are:

- CAN Message failure
- CRC failure
- Cruise Stuck Switch
- Vehicle Speed Signal Failure
- Accelerator Pedal Failure

STEERING COLUMN CONTROL MODULE (SCCM)

STEERING COLUMN CONTROL MODULE (SCCM)

Refer to COMPONENT INDEX .
--

The SCCM is the interface between the CSWC and the PCM. The CSWC evaluates the status of the CSWC buttons (pressed or not pressed) and then outputs this information to the SCCM. The SCCM takes this information from the LIN input and sends CAN-C cruise control request outputs to the PCM.

If the SCCM detected invalid signals or no signal from the CSWC, it will set a LIN based DTC on the CAN-C network.

Inputs

- Receives vehicle configuration indicating cruise and active speed limiter options are available on the vehicle

- LIN inputs from CSWC

Outputs

- Transmits the LIN CSWC inputs over the CAN-C network to the PCM
- Power and ground to the CSWC
- Illumination to the CSWC

TRANSMISSION CONTROL MODULE (TCM)

TRANSMISSION CONTROL MODULE (TCM)

Refer to COMPONENT INDEX .
--

The TCM receives inputs from the PCM for cruise control operation and performs requested down and up shifts when commanded.

When the vehicle is in manual shift mode, the transmission will not shift due to requests by the cruise system unless the transmission requires an upshift for the protection of powertrain components. For the vehicles equipped with transmission autostick or Electronic Range Selection (ERS) mode, the cruise system will not prevent the transmission from being manually shifted. The priority of different gear change requests is managed by TCM.

The cruise Resume function allows immediate downshifts based on current speed when the cruise Resume switch is pressed, by forcing a series of downshifts if the driver presses the Resume button and the vehicle is moving below the cruise control set speed. This will give the vehicle better acceleration to reach the set speed when the Resume button is pressed

Under downhill conditions, the PCM may require a transmission gear different from that selected by the transmission shift map, to maintain the cruise set speed. In these conditions, the PCM will transmit a maximum gear request to limit the operating range of the transmission. The transmission then will determine if selecting the maximum gear requested by the PCM can be honored, or would result in an engine overspeed condition, therefore not honoring the request from the PCM.

Inputs

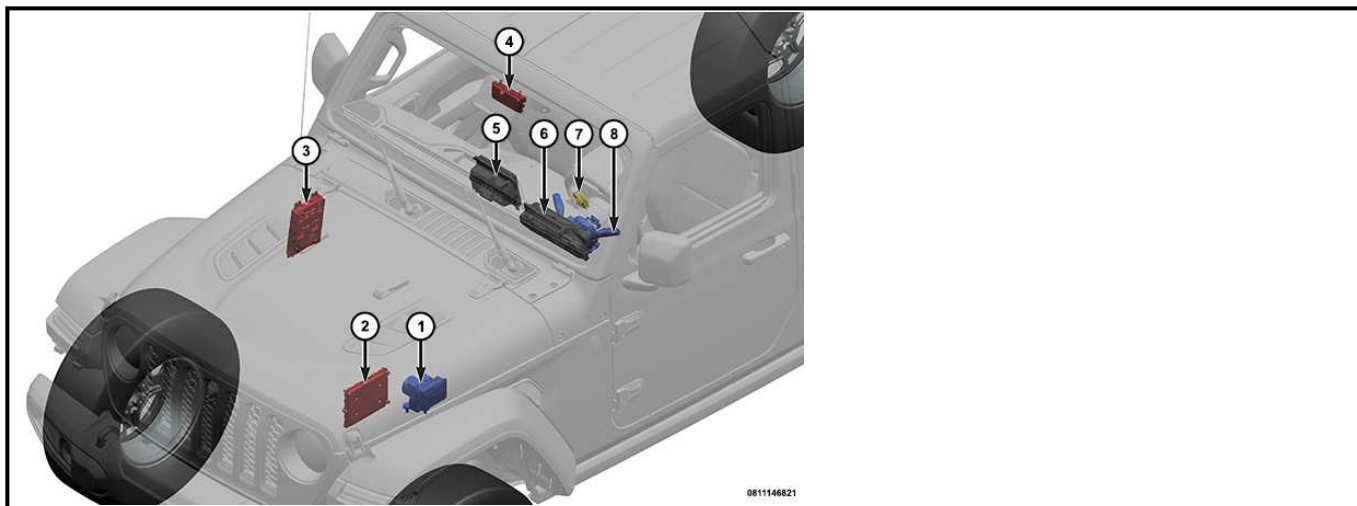
- Presence of the cruise control system which indicates to the TCM that cruise is present on the vehicle
- Cruise control system operating state from the PCM
- Cruise set speed from the PCM over the CAN-C bus. This is to prevent unnecessary shifting
- Downshift request from the PCM over the CAN-C bus

Outputs

- Outputs the current transmission gear to the PCM
- Responds to gear change requests from the PCM
- Indication of Limp Mode to the PCM

ADAPTIVE CRUISE CONTROL WITH STOP AND GO

DESCRIPTION



The following components are part of the Adaptive Cruise Control (ACC) with Stop and Go system:

COMPONENT INDEX

1.	Refer to <u>ANTI-LOCK BRAKE SYSTEM (ABS) MODULE.</u>
2.	Refer to <u>POWERTRAIN CONTROL MODULE (PCM).</u>
3.	Refer to <u>BODY CONTROL MODULE (BCM).</u>
4.	Refer to <u>DRIVERS ASSISTANCE SYSTEM MODULE (DASM).</u>
5.	Refer to <u>RADIO.</u>
6.	Refer to <u>INSTRUMENT PANEL CLUSTER (IPC).</u>
7.	Refer to <u>CRUISE CONTROL SWITCH MODULE (CSWC).</u>
8.	Refer to <u>STEERING COLUMN CONTROL MODULE (SCCM).</u>

Adaptive Cruise Control (ACC) with Stop and Go is a Driver Assistance System with functionality beyond that of the conventional Cruise Control system.

When the ACC with Stop and Go equipped vehicle is brought to a stop due to the presence of a slower moving target vehicle, the ACC with Stop and Go system can keep the host vehicle at a stand-still by initially applying the brakes, and once the brake system times out, by applying the Electronic Park Brake (EPB). However, if the target vehicle starts moving before the brake system times out, the ACC with Stop and Go system allows the vehicle to automatically resume motion with little or no driver intervention.

Vehicles that are equipped with the ACC with Stop and Go system incorporate the DASM to control the ACC with Stop and Go system and conventional Cruise Control system.

OPERATION

The ACC On/Off button in the CSWC can be used to enable or disable the ACC with Stop and Go system. The CSWC sends the status of the ACC button to the SCCM over the Local Interface Network (LIN) network. The SCCM gates this signal to the DASM.

Once the system is enabled, the ACC with Stop and Go or the conventional Cruise Control system can be engaged by pressing the Set+ or Set- buttons in the CSWC. The CSWC transmits the Set button state to the SCCM. The SCCM gates the signal to the DASM. If driver override occurs and either Set button is pressed, the current speed becomes the new set speed. The DASM determines the set speeds based on the vehicle speed value received from the ABS module.

For ACC with Stop and Go, the driver can configure the set target distance by using either of the two distance buttons in the CSWC. These buttons are:

- Distance Decrease - This button is used to select a shorter following distance than the current selected following distance.

- Distance Increase - This button is used to select a longer following distance than the current selected following distance.

The CSWC sends the status of the Distance buttons to the SCCM which gates the request to the DASM.

The Distance value is interpreted as a time gap by the DASM. This value is modified by the presence of a Trailer Tow Module (TTM) that is actively operating during ACC with Stop and Go operation.

When the Resume or Cancel button is used, the CSWC sends the request to the SCCM which gates the request to the DASM.

For the North American Free Trade Agreement (NAFTA) vehicle, the range of operation for the ACC with Stop and Go system is a minimum of 32 Kilometers Per hour (km/h) (20 Miles Per Hour/mph) and a maximum of 160 km/h (100 mph).

The DASM transmits the ACC with Stop and Go or the conventional Cruise Control system states over the Controller Area Network (CAN) bus. When the ACC with Stop and Go is in use, the DASM also transmits the adjusted vehicle speed on the CAN bus. The adjusted speed is determined when the DASM detects a target vehicle in the path of the host vehicle and the system is in the Engaged/Set state. The system automatically configures the speed of the host vehicle to the speed of the target vehicle and trails the target vehicle at a set following distance. In this case the desired speed of the vehicle will be less than the set speed.

The DASM uses its own internal logic to convert the vehicle speed that is sent to it by the ABS module to the vehicle speed that is to be displayed to the driver on the IPC.

The DASM uses an integral radar and camera, by means of data fusion, to detect vehicles in the forward path of the vehicle that are moving, stopped or stationary. The DASM considers an object moving if it has a velocity greater than zero while being tracked. The DASM considers an object stopped if it has a velocity greater than zero and then comes to a stop. The DASM will consider an object stationary if it has zero velocity the entire time that it is being tracked.

When the DASM detects that an object with velocity is slowing to a stop, the DASM sends a request to the ABS module for braking. The ABS module then sends a signal back to the DASM confirming that the host vehicle is at a complete stop. The ABS module then begins an internal timer countdown and holds the brake. If the target object begins to accelerate, the DASM sends the request to the ABS module to release the brakes. If the countdown timer expires before the target vehicle starts to accelerate, the DASM sends a request to the ABS module to apply the EPB until the target object begins to move. At this point, the DASM sends a request to the ABS module to release the EPB. If the host vehicle is on an incline and the ABS modules internal timer expires, movement of the host vehicle will require driver override by depressing the accelerator pedal or by pressing the Resume button. The driver override condition is detected by the PCM and sent to the DASM while the Resume button actuation is detected by the SCCM and bussed to the DASM.

When the host vehicle is brought to a stop due to DASM object detection, the driver seatbelt status and the driver door ajar signal are monitored. If the seatbelt buckle is unbuckled or the door becomes ajar, the system will become disabled once the EPB is applied.

The DASM also requests a brake prefill command to the ABS module. Under normal circumstances, there is space between the brake pads and the brake rotors to prevent the brake pads from wearing out prematurely. This space between the brake pads and the brake rotors increases the response time during any situation which may require emergency braking. The brake prefill prepares the system for braking by moving the brake pads closer to the brake rotor to improve braking response time. The DASM controls the activation and deactivation of the brake prefill operation.

If the ACC system is unable to maintain the following distance, a take over request is issued. This is a request for the vehicle driver to take control of the vehicle for safety reasons. This request is initiated by the system simultaneously sending an audible and visual warning to the IPC, along with an audio warning to the audio system. A take over request can also be initiated by the DASM when there is a close cut-in of a vehicle from an adjacent lane to the lane that the host vehicle is currently occupying.

The ACC system is also capable of providing proximity warning. A proximity warning occurs when an object or a vehicle in close proximity is detected. This warning will alert the driver if the ACC system predicts that its maximum braking level is not sufficient to maintain the set distance. Like the take over request warning, the proximity warning system request is initiated by the system simultaneously sending an audible and visual warning to the IPC, along with an audio warning to the audio system.

The DASM is able to determine its acceleration, deceleration and gear requests by utilizing sensor data along with specific data received from the PCM, ABS module and the TCM (MTX not supported for this function). This allows for when the slower moving object or vehicle is no longer detected, the ACC with Stop and Go system will accelerate the host vehicle back to the original set speed with no customer interaction. Using those same inputs, the DASM also allows for an overtake event to occur. When the host vehicle is trailing a slower moving object and the host driver activates the turn indicator, the DASM applies additional amounts of acceleration while still trailing the object vehicle to aid in a lane shift maneuver. In locations with left hand drive traffic, overtake aid will only be provided on the left hand side. The same applies for the right hand side. The DASM is able to determine the direction of traffic flow by observing oncoming traffic. The DASM will disable overtake aid if the DASM detects an object in the lane the vehicle is attempting to move into in order to pass the slower moving object vehicle. The overtake aid also disables or will not assist if the host vehicle is equipped with a Blind Spot Monitor (BSM) system that is currently detecting a vehicle in the blind spot of the host vehicle.

For transmission shift requests, the DASM sends the gear requests to the ABS module which in turn sends the request to the TCM as well as the ACC with Stop and Go system status. The DASM transmits the current set speed as well as the DASM requested desired speed to the TCM. The TCM uses this information to enable a internal logic cruise shift strategy.

Deactivation Conditions:

The ACC with Stop and Go system has several cancel and switch-off conditions that will deactivate the system. The conditions are as follows:

- DASM internal fault
- DASM Electronic Control Unit (ECU) over temperature
- DASM external fault
- ACC system status faulted
- Brakes applied by vehicle operator
- EPB applied or being applied
- Driver door opened while vehicle is travelling below 5 MPH and vehicle is not at a standstill
- Seatbelt is unfastened while vehicle is travelling below 5 MPH
- Vehicle is above the maximum ACC operating speed
- Vehicle is below the minimum ACC operating speed
- Transfer case engaged in 4LO
- Transmission is in **P**ark, **N**eutral or **R**everse
- Electronic Stability Control (ESC) event occurs
- ESC is in full OFF mode
- Brake are overheated
- Hill Descent Control (HDC) is active or being activated
- Stationary object below minimum distance threshold in front of the vehicle
- Object detected in close proximity is below minimum distance threshold in front of the vehicle
- Vehicle is rolling backward
- Vehicle is on a steep grade while below calibrated speeds when travelling downhill or uphill
- Forward Collision Warning + intervention occurs
- CSWC CANCEL button pressed

- DASM radar blinded, misaligned or requiring service
- Cancel requests from the ESC system
- ACC On/Off button pressed when the ACC is in an engaged state
- Conventional Cruise Control On/Off button pressed while the ACC is in an engaged state
- Conventional Cruise Control On/Off button pressed while the conventional Cruise Control system is in an engaged state
- Engine stops or falls below a calibrated minimum RPM value
- Engine overspeed detected
- DASM detects the brake switch is ON while the ITBM indicates a trailer is present

ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Refer to **COMPONENT INDEX**.

The ABS module is an integral controller of the ACC with Stop and Go system. Most performance functions for this system route through or start from the ABS module.

The ABS module incorporates the EPB module, the ESC module and the Electronic Stability Protection (ESP) system and uses all of these modules and systems to help facilitate ACC with Stop and Go operation.

Inputs

- Door ajar status from the BCM
- Transmission PRNDL status from the TCM
- Occupant Restraint Controller (ORC) seatbelt unbuckled signal to the ABS module
- Accelerator Pedal Position Sensor (APPS) signal from the PCM
- Brake prefill requests from the DASM
- Vehicle configuration data from the BCM
- ACC system type and DASM equipped signal from the BCM
- Cruise Control override signal from the PCM
- DASM ACC operating state signals
- DASM engine transmission torque value signal
- DASM fuel shut off disable signal
- DASM engine torque request signal
- DASM requested maximum gear value
- SCCM CSWC button outputs pertinent to ACC with Stop and Go requirements

Outputs

- Braking status to the DASM
- Yaw rates to the DASM
- Vehicle acceleration to the DASM
- Brake torque to the DASM
- Brake intervention active to the DASM
- Wheel speed data to the DASM
- Vehicle speed data to the DASM
- Brake pedal status to the DASM
- EPB status to the DASM
- Active brake event to the DASM
- ACC engaged status to the PCM

- Fuel shut off, fuel economy measure, disable signal to the PCM
- Requested torque management requests to the PCM
- Acceleration and deceleration request to the PCM
- Gear maximum request from to the TCM
- ACC with Stop and Go active message to the TCM

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

When the ACC with Stop and Go system is in the Set state, the ABS module transmits an ACC engaged signal to the BCM. The BCM gates and then broadcasts this signal to the relevant modules and systems on the bus that are involved in the ACC operation.

Inputs

- ACC engaged signal from the ABS module

Outputs

- Ignition OFF time to DASM
- Wiper system status to DASM for ambient temperature determination
- Vehicle configuration data to multiple bus nodes
- Outside air temperature value to the DASM
- Battery system voltage to the DASM
- Commanded ignition status to multiple network nodes
- Driver door ajar signal to the DASM and ABS module
- DASM configuration and ACC system type for several network nodes
- ACC engaged signal to multiple network nodes

CRUISE CONTROL SWITCH MODULE (CSWC)

Refer to [**COMPONENT INDEX**](#).

The CSWC contains the ACC with Stop and GO Distance buttons as well as the conventional Cruise Control buttons. When these buttons are pressed, the CSWC sends a LIN bus message to the SCCM with the pushed button value.

DRIVERS ASSISTANCE SYSTEM MODULE (DASM)

Refer to [**COMPONENT INDEX**](#).

The DASM detects the following signals that are general requirements for system functionality:

- Ignition ON, time since last ON value determined from the BCM
- 12v battery from the BCM
- Wheel speed sensor values from the ABS module to determine if the vehicle is in standstill or in motion
- Steering wheel angle values from the SCCM
- Engine configuration information from the PCM
- Accelerator Pedal Position Sensor (APPS) actual value
- If equipped, vehicle ride height information from the Active Stabilizer Control Module (ASCM) for vertical radar alignment determination
- ESC active signal from the ABS module indicating that ESC is able to provide braking during ACC with Stop and GO operation

Inputs

- BSM warning system and configuration inputs
- Integrated Trailer Brake Module (ITBM) trailer status and brake switch input
- Internal DASM signal for camera or radar blocked
- ABS module input for braking status
- ABS module input for yaw rates
- ABS module input vehicle acceleration
- ABS module input brake torque
- ABS module input brake intervention active
- ABS module wheel speed data
- ABS module vehicle speed data
- ABS module brake pedal status
- ABS module EPB status
- ABS module active brake event
- PCM Cruise Control override
- PCM engine torque status and management requests
- PCM accelerator pedal position status
- PCM RPM status
- PCM transmission torque status
- PCM engine configuration information
- PCM Engine Stop Start (ESS) status, if equipped
- SCCM turn signal active
- Internal radar and camera communications
- BCM battery voltage
- BCM commanded ignition state
- BCM ignition off timing
- BCM vehicle configuration information
- BCM ambient air temperature
- BCM wiper system status
- BCM driver door ajar signal
- TCM transmission limp mode status
- TCM PRND status
- TCM target and current gear
- IPC speedometer unit; miles
- ASCM suspension ride height information
- Drivetrain Control Module (DTCM) transfer case status
- SCCM steering wheel angle
- ORC driver seat belt buckle status
- CSWC Cruise Control switch status and requests

Outputs

- ACC system state to multiple BUS nodes
- ACC message requests to the IPC
- ACC set speed status to the IPC
- ACC visual and audio warning enable requests to the IPC and Radio
- Vehicle speed actual, desired and set values to the TCM

- Transmission max gear range to the ABS module
- ACC system configuration requests to the ABS module and PCM
- Engine management requests to support ACC operation
- Brake prefill request to the ABS module

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [**COMPONENT INDEX**](#).

The IPC is used in the ACC system for displaying visual, auditory, and textual messages to the driver of the vehicle for the ACC system.

Inputs

- ACC warning display telltale requests from the DASM
- ACC system operation display information telltale requests from the DASM
- Vehicle configuration parameters from the BCM
- Cruise Control Set speed display from the DASM

Outputs

- Visual, auditory, and textual messages to the vehicle operator

POWERTRAIN CONTROL MODULE (PCM)

Refer to [**COMPONENT INDEX**](#).

The PCM interfaces with several nodes on the BUS network to support ACC with Stop and Go operation as well as the conventional Cruise Control operation.

Inputs

- ACC engaged status from the ABS module
- Fuel shut off, fuel economy measure, disable signal from ABS module
- Vehicle configuration information from the BCM
- DASM requested torque management requests from the ABS module
- DASM acceleration and deceleration request from the ABS module
- APPS indicating driver interaction with the pedal

Outputs

- Cruise Control override signal to the DASM
- Engine torque status and management requests to the DASM
- Accelerator pedal position status to the DASM
- RPM status to the DASM
- Transmission torque status to the DASM
- Engine configuration information to the DASM
- ESS status, if equipped, to the DASM
- Engine in limp home mode status to the DASM

RADIO

Refer to [**COMPONENT INDEX**](#).

In certain circumstances, the radio receives an input from the DASM to provide an auditory warning chime strategy to the vehicle operator

Inputs

- Audible warning requests from the DASM

Outputs

- Auditory warning to the vehicle operator

STEERING COLUMN CONTROL MODULE (SCCM)

Refer to [COMPONENT INDEX](#).

The SCCM is the interface between the CSWC and the DASM. The CSWC evaluates the status of the Cruise Control buttons (pressed or not pressed) and then outputs this information to the SCCM. The SCCM receives this LIN input from the CSWM and forward the request over the CAN-C network to the DASM.

If the SCCM detected invalid signals or no signal from the CSWC, it will set a LIN based DTC on the CAN-C network.

Inputs

- Receives vehicle configuration indicating Cruise Control, ACC Stop and Go and Active Speed Limiter options are available on the vehicle
- CSWC switch LIN inputs from CSWC

Outputs

- Transmits the LIN CSWC inputs over the CAN-C network to the DASM.
- Power and ground to the CSWC
- Illumination to the CSWC
- Steering wheel angle sensor output to the DASM
- Turn signal lever state to the DASM
- Certain ACC with Stop and Go and conventional Cruise Control button outputs to the ABS module

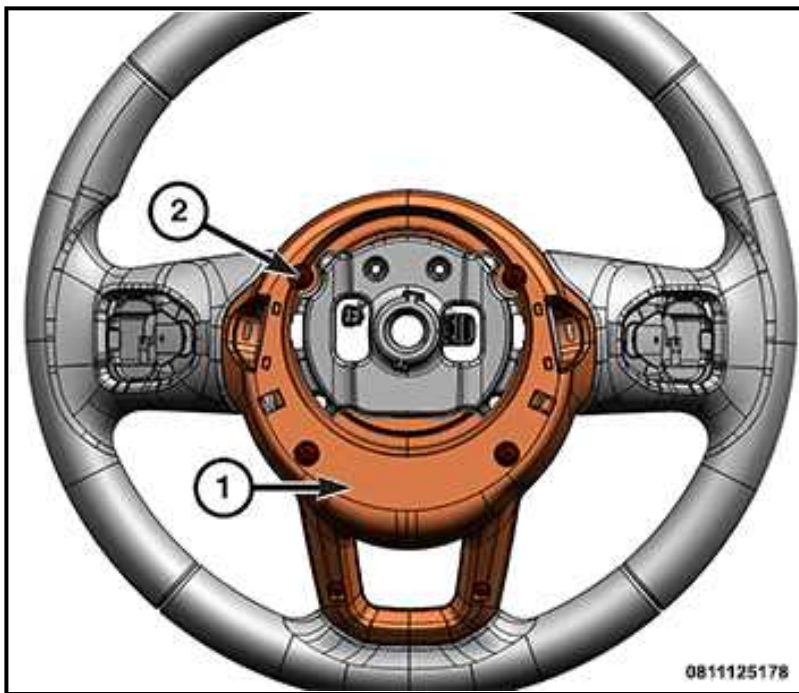
SWITCH, SPEED CONTROL

REMOVAL AND INSTALLATION

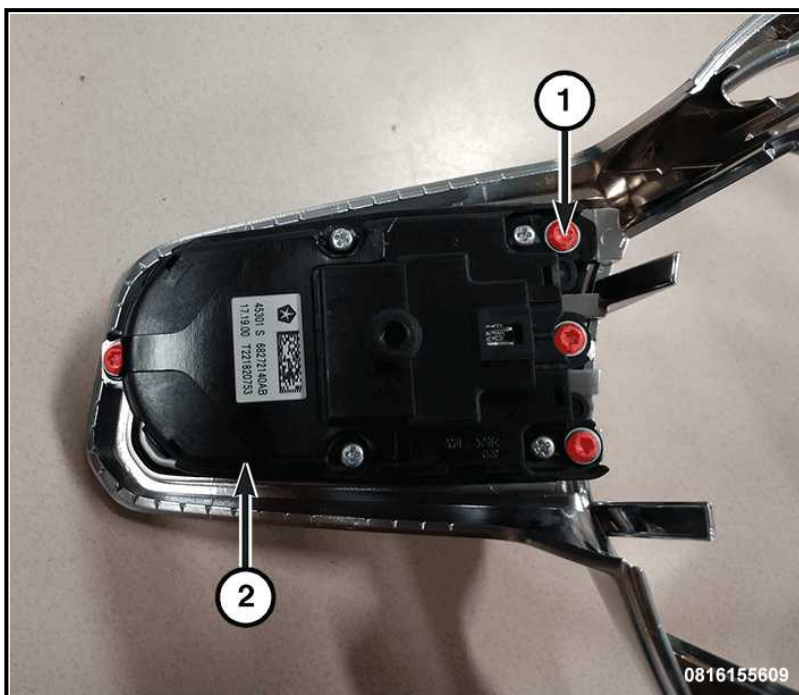
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the remote radio switch Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
.
3. Remove the steering wheel. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#) .



4. Remove the fasteners (2) securing the steering wheel back cover (1) to the steering wheel, then remove the steering wheel back cover from the steering wheel.
5. Pull the steering wheel bezel away from the steering wheel and disconnect the cruise control switch and Electronic Vehicle Information Center (EVIC) switch wire harness connectors, then remove the bezel with switches.



6. Remove the fasteners (1) securing the cruise control switch to the bezel and remove the cruise control switch (2) from the bezel.

INSTALLATION

1. Position the cruise control switch to the steering wheel bezel.
2. Install the fasteners securing the cruise control switch to the bezel and tighten securely.
3. Position the bezel to the steering wheel and connect the cruise control and EVIC switch wire harness connectors.
4. Install the fasteners securing the steering wheel back cover to steering wheel and tighten securely.
5. Install the steering wheel. Refer to [WHEEL, STEERING, REMOVAL AND INSTALLATION](#) .

6. Install the remote radio switch Refer to **SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION** .

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7. Connect the negative battery cable(s). Refer to the appropriate service information .

2021 GENERAL INFORMATION

(Steering Column Control Module (SCCM) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
P0815-2A	UPSHIFT SWITCH - STUCK
P0816-2A	DOWNSHIFT SWITCH-STUCK
P0826-11	UP/DOWN SHIFT SWITCH-CIRCUIT SHORT TO GROUND
P0826-13	UP/DOWN SHIFT SWITCH-CIRCUIT OPEN
P0826-15	UP/DOWN SHIFT SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN
B1D9C-00	STEERING COLUMN TILT SWITCH
B1D9C-2A	STEERING COLUMN TILT SWITCH-STUCK
B2225-00	(SCM) STEERING COLUMN MODULE INTERNAL
B2306-2A	FRONT WASHER SWITCH-STUCK
B232E-00	REAR WASHER SWITCH STUCK
B23A1-2A	FLASH TO PASS/OPTICAL HORN SWITCH-STUCK
C1240-76	STEERING ANGLE SENSOR ANGLE OVERTRAVEL PERFORMANCE- WRONG MOUNTING POSITION
C2129-16	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
C2129-17	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
C212A-16	SYSTEM VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
C212A-17	SYSTEM VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
C2205-00	STEERING ANGLE SENSOR INTERNAL
C2205-29	STEERING ANGLE SENSOR INTERNAL-SIGNAL INVALID
C2205-2F	STEERING ANGLE SENSOR INTERNAL-SIGNAL ERRATIC
C2205-41	STEERING ANGLE SENSOR INTERNAL-GENERAL CHECKSUM FAILURE
C2205-96	STEERING ANGLE SENSOR INTERNAL-COMPONENT INTERNAL FAILURE
U0001-00	CAN C BUS
U0002-00	CAN C BUS OFF PERFORMANCE
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0401-00	IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM
U0422-00	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
U0423-00	IMPLAUSIBLE DATA RECEIVED FROM CLUSTER-CCN
U1008-00	LIN 1 BUS
U121E-00	LOST COMMUNICATION WITH STEERING WHEEL CRUISE CONTROL SWITCH

DIAGNOSIS AND TESTING

P0815-2A-UPSHIFT SWITCH - STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information .**

THEORY OF OPERATION

The Paddle Shifters are integral to the Remote Radio Switches. The Paddle Shifters in the two Remote Radio Switch units are normally open MUX switches that are hard wired to the Right Steering Wheel Switch (Speed Control Switch). The Right Steering Wheel Switch (Speed Control Switch) provides a 5 volt signal and return

circuit to the switches. Both switches share the signal and return circuits. The Right Steering Wheel Switch senses the status of the switches by reading the voltage drop of the signal circuit.

When the Right Steering Wheel Switch senses an input (voltage drop) from any one of the Paddle Shifters, it communicates the switch status message to the Steering Column Control Module (SCCM) through the LIN Bus (through the Clockspring). The SCCM then broadcasts the switch status information over the CAN Bus to the Transmission Control Module (TCM) communicating the request for Transmission upshift or downshift.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Upshift Paddle Shift Switch has been active for greater than 45 seconds.

DEFAULT ACTION

- The Upshift Paddle Shift Switch will be inactive.

POSSIBLE CAUSES

Possible Causes
UPSHIFT PADDLE SHIFT SWITCH STUCK
UPSHIFT PADDLE SHIFT SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read Steering Column Control Module (SCCM) DTCS.

Did the DTC return?

Yes

- Visually and physically inspect the Upshift Paddle Shift Switch for any debris or foreign material that may contribute to a sticking or stuck switch. If no problem is found, Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE UPSHIFT PADDLE SHIFT SWITCH STATUS VIA THE SCAN TOOL

1. With the scan tool, view the Upshift Paddle Shift Switch status.
2. While monitoring the Upshift Paddle Shift Switch status, actuate the switch multiple times.

Does the scan tool display the correct status of the switch in the data display?

Yes

- Go To [3](#)

No

- Verify all connections between the Downshift Paddle Shift Switch and the SCCM are properly made, properly seated and verify proper terminal tension. If no problems are found, replace the Upshift Paddle Shift Switch in accordance with the Service Information. Refer to **SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0816-2A-DOWNSHIFT SWITCH-STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Paddle Shifters are integral to the Remote Radio Switches. The Paddle Shifters in the two Remote Radio Switch units are normally open MUX switches that are hard wired to the Right Steering Wheel Switch (Speed Control Switch). The Right Steering Wheel Switch (Speed Control Switch) provides a 5 volt signal and return circuit to the switches. Both switches share the signal and return circuits. The Right Steering Wheel Switch senses the status of the switches by reading the voltage drop of the signal circuit.

When the Right Steering Wheel Switch senses an input (voltage drop) from any one of the Paddle Shifters, it communicates the switch status message to the Steering Column Control Module (SCCM) through the LIN Bus (through the Clockspring). The SCCM then broadcasts the switch status information over the CAN Bus to the Transmission Control Module (TCM) communicating the request for Transmission upshift or downshift.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Downshift Paddle Shift Switch has been active for greater than 45 seconds.

DEFAULT ACTION

- The Downshift Paddle Shift Switch will be inactive.

POSSIBLE CAUSES

Possible Causes
DOWNSHIFT PADDLE SHIFT SWITCH STUCK
DOWNSHIFT PADDLE SHIFT SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Visually and physically inspect the Downshift Paddle Shift Switch for any debris or foreign material that may contribute to a sticking or stuck switch. If no problem is found, Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE DOWNSHIFT PADDLE SHIFT SWITCH STATUS VIA THE SCAN TOOL

1. With the scan tool, view the Downshift Paddle Shift Switch status.
2. While monitoring the Downshift Paddle Shift Switch status, actuate the switch multiple times.

Does the scan tool display the correct status of the switch in the data display?

Yes

- Go To [3](#)

No

- Verify all connections between the Downshift Paddle Shift Switch and the SCCM are properly made, properly seated and verify proper terminal tension. If no problems are found, replace the Downshift Paddle Shift Switch in accordance with the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0826-11-UP/DOWN SHIFT SWITCH-CIRCUIT SHORT TO GROUND

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Paddle Shifters are integral to the Remote Radio Switches. The Paddle Shifters in the two Remote Radio Switch units are normally open MUX switches that are hard wired to the Right Steering Wheel Switch (Speed Control Switch). The Right Steering Wheel Switch (Speed Control Switch) provides a 5 volt signal and return circuit to the switches. Both switches share the signal and return circuits. The Right Steering Wheel Switch senses the status of the switches by reading the voltage drop of the signal circuit.

When the Right Steering Wheel Switch senses an input (voltage drop) from any one of the Paddle Shifters, it communicates the switch status message to the Steering Column Control Module (SCCM) through the LIN Bus (through the Clockspring). The SCCM then broadcasts the switch status information over the CAN Bus to the Transmission Control Module (TCM) communicating the request for Transmission upshift or downshift.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects one of the Paddle Shift Switch Signal circuits is shorted to ground for greater than 40 milliseconds.

DEFAULT ACTION

- The Paddle Shift Switches will be inactive.

POSSIBLE CAUSES

Possible Causes
PADDLE SHIFT SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
LEFT OR RIGHT PADDLE SHIFT SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. DISCONNECT THE DOWNSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Downshift Paddle Shift Switch in accordance with the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. DISCONNECT THE UPSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Upshift Paddle Shift Switch in accordance with the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0826-13-UP/DOWN SHIFT SWITCH-CIRCUIT OPEN

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Paddle Shifters are integral to the Remote Radio Switches. The Paddle Shifters in the two Remote Radio Switch units are normally open MUX switches that are hard wired to the Right Steering Wheel Switch (Speed Control Switch). The Right Steering Wheel Switch (Speed Control Switch) provides a 5 volt signal and return circuit to the switches. Both switches share the signal and return circuits. The Right Steering Wheel Switch senses the status of the switches by reading the voltage drop of the signal circuit.

When the Right Steering Wheel Switch senses an input (voltage drop) from any one of the Paddle Shifters, it communicates the switch status message to the Steering Column Control Module (SCCM) through the LIN Bus (through the Clockspring). The SCCM then broadcasts the switch status information over the CAN Bus to the Transmission Control Module (TCM) communicating the request for Transmission upshift or downshift.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects one of the Paddle Shift Switch Signal circuits is open for greater than 40 milliseconds.

DEFAULT ACTION

- The Paddle Shift Switches will be inactive.

POSSIBLE CAUSES

Possible Causes
PADDLE SHIFT SWITCH SIGNAL CIRCUIT OPEN LEFT OR RIGHT PADDLE SHIFT SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DISCONNECT THE UPSHIFT AND DOWNSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTORS - INSPECT THE WIRING AND CONNECTORS

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested.
3. Inspect the wiring harness between the component harness connector(s) containing the circuit being tested and the ECU harness connector for any damaged wires, connectors, and open/spread terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [3](#)

3. CONNECT THE UPSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Connect the indicated component harness connector.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

NOTE: Additional DTCs may set in the SCCM and the Radio. Disregard any other DTCs that may set.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the Upshift Paddle Shift Switch in accordance with the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

4. DISCONNECT THE UPSHIFT AND CONNECT THE DOWNSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTORS - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Connect the indicated component harness connector.
3. Disconnect the indicated component harness connector.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Downshift Paddle Shift Switch in accordance with the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

P0826-15-UP/DOWN SHIFT SWITCH-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Paddle Shifters are integral to the Remote Radio Switches. The Paddle Shifters in the two Remote Radio Switch units are normally open MUX switches that are hard wired to the Right Steering Wheel Switch (Speed Control Switch). The Right Steering Wheel Switch (Speed Control Switch) provides a 5 volt signal and return circuit to the switches. Both switches share the signal and return circuits. The Right Steering Wheel Switch senses the status of the switches by reading the voltage drop of the signal circuit.

When the Right Steering Wheel Switch senses an input (voltage drop) from any one of the Paddle Shifters, it communicates the switch status message to the Steering Column Control Module (SCCM) through the LIN Bus

(through the Clockspring). The SCCM then broadcasts the switch status information over the CAN Bus to the Transmission Control Module (TCM) communicating the request for Transmission upshift or downshift.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects one of the Paddle Shift Switch Signal circuits is shorted to voltage or both Left & Right Paddle Shift Switches are open for greater than 40 milliseconds.

DEFAULT ACTION

- The Paddle Shift Switches will be inactive.

POSSIBLE CAUSES

Possible Causes
PADDLE SHIFT SWITCH SIGNAL CIRCUIT OPEN
PADDLE SHIFT SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DISCONNECT THE UPSHIFT AND DOWNSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTORS - INSPECT THE WIRING AND CONNECTORS

1. Turn the ignition off.

2. Disconnect the component harness connector(s) containing the circuit being tested.
3. Inspect the wiring harness between the component harness connector(s) containing the circuit being tested and the ECU harness connector for any damaged wires, connectors, and open/spread terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To **3**

3. CONNECT THE UPSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTOR - ERASE DTCs AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Connect the indicated component harness connector.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

NOTE: Additional DTCs may set in the SCCM and the Radio. Disregard any other DTCs that may set.

Did the DTC return?

Yes

- Go To **4**

No

- Replace the Upshift Paddle Shift Switch in accordance with the Service Information. Refer to **SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

4. DISCONNECT THE UPSHIFT AND CONNECT THE DOWNSHIFT PADDLE SHIFT SWITCH HARNESS CONNECTORS - ERASE DTCs AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Connect the indicated component harness connector.
3. Disconnect the indicated component harness connector.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the Downshift Paddle Shift Switch in accordance with the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

- Test complete.

B1D9C-00-STEERING COLUMN TILT SWITCH

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located at the end of the Steering Column, beneath the Steering Wheel. The SCCM includes the Clockspring, the Multifunction Switch and a LIN/CAN C Gateway. LIN Bus messages received by the SCCM are sent over the CAN C Bus to the appropriate modules.

The Steering Column Tilt Switch, if equipped, provides switch signals to the Steering Column Control Module (SCCM) in order to control the movement of the Steering Column.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects a Steering Column Power Tilt Switch failure for greater than 50 milliseconds.

DEFAULT ACTION

- The Steering Column Power Tilt function will be inoperative.

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN TILT SWITCH CONTROL CIRCUIT SHORTED TO GROUND OR VOLTAGE
STEERING COLUMN TILT SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DISCONNECT THE STEERING COLUMN TILT SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Steering Column Tilt Switch in accordance to the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

3. ISOLATE AND CHECK THE (A92) FUSED B(+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. If currently connected, disconnect the component harness connector for the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage on the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (A92) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B1D9C-2A-STEERING COLUMN TILT SWITCH-STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located at the end of the Steering Column, beneath the Steering Wheel. The SCCM includes the Clockspring, the Multifunction Switch and a LIN/CAN C Gateway. LIN Bus messages received by the SCCM are sent over the CAN C Bus to the appropriate modules.

The Steering Column Tilt Switch, if equipped, provides switch signals to the Steering Column Control Module (SCCM) in order to control the movement of the Steering Column.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Steering Column Power Tilt and Telescope Switch has been active for greater than 50 seconds.

DEFAULT ACTION

- The Tilt and Telescope Switches will be inactive.

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN TILT SWITCH STUCK
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK IF DTC RETURNS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Visually and physically inspect the Steering Column Tilt Switch for any debris or foreign material that may cause a sticking or stuck switch. If no problem is found, Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

B2225-00-(SCM) STEERING COLUMN MODULE INTERNAL

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects an internal failure.

DEFAULT ACTION

- The Rear Wiper will be inoperative.
- The Front Wipers will default to Low setting
- Cruise control set to implausible
- Shift By Wire or Steering Angle Sensor set to idle

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)
- **CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS**

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B2306-2A-FRONT WASHER SWITCH-STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Right Hand (RH) Multifunction Switch provides a Front Wiper Washer Switch signal to the Steering Column Control Module (SCCM). The SCCM sends the Front Wiper Washer Switch signal to the Body Control Module (BCM) through the CAN-C Bus circuit. When the BCM receives the Front Wiper Washer Switch signal from the SCCM, the BCM activates the Front Wiper Washer Pump.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.

- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Front Washer Switch has been active for greater than 20 seconds.

DEFAULT ACTION

- The Front Washer Switch will be inactive.

POSSIBLE CAUSES

Possible Causes
FRONT WASHER SWITCH STUCK
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Visually and physically inspect the Front Washer Switch for any debris or foreign material that may contribute to a sticking or stuck switch. If no problem is found, Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B232E-00-REAR WASHER SWITCH STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Right Hand (RH) Multifunction switch provides a Rear Wiper Washer Switch signal to the Steering Column Control Module (SCCM). The SCCM sends the Rear Wiper Washer Switch signal to the Body Control Module (BCM) through the LIN 3 Bus circuit. When the BCM receives the Rear Wiper Washer Switch signal from the SCCM, the BCM activates the Rear Wiper Washer Pump.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Rear Washer Switch has been active for greater than 20 seconds.

DEFAULT ACTION

- The Rear Washer Switch will be inactive.

POSSIBLE CAUSES

Possible Causes
REAR WASHER SWITCH STUCK
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Visually and physically inspect the Rear Washer Switch for any debris or foreign material that may contribute to a sticking or stuck switch. If no problem is found, Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

B23A1-2A-FLASH TO PASS/OPTICAL HORN SWITCH-STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The LH Multifunction Switch provides Flash to Pass/Optical Horn Switch signals to the Steering Column Control Module (SCCM). The SCCM sends the requested signal to the Body Control Module (BCM) through the LIN 3 Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 7 and 17 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Flash To Pass/Optical Horn Switch has been active for greater than 20 seconds.

DEFAULT ACTION

- The Flash To Pass/Optical Horn Switch will be inactive.

POSSIBLE CAUSES

Possible Causes
FLASH TO PASS/OPTICAL HORN SWITCH STUCK
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Visually and physically inspect the Left Hand (LH) Multifunction Switch for any debris or foreign material that may contribute to a sticking or stuck switch. If no problem is found, Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

C1240-76-STEERING ANGLE SENSOR ANGLE OVERTRAVEL PERFORMANCE-WRONG MOUNTING POSITION

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Steering Angle Sensor (SAS) for this vehicle is integral to the Steering Column Control Module (SCCM).

WHEN MONITORED

- With Ignition on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects an incorrect installation of the Steering Angle Sensor (SAS).

DEFAULT ACTION

- The SAS will be inactive.
- ESP is off

POSSIBLE CAUSES

Possible Causes
STEERING ANGLE SENSOR (SAS) NOT ALIGNED CORRECTLY
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: This DTC will set the when the Steering Angle Sensor (SAS) has been installed incorrectly. Before proceeding with this test, if any steering system service was recently performed, refer to the Service Information to verify the repairs have been performed correctly.

1. Confirm the steering wheel and front tires are straight ahead.
2. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
3. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
4. With the scan tool, erase all DTCs.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Rotate steering wheel to the right steering lock, then to the left steering lock.
8. Repeat Step 7, and then center the steering wheel.
9. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Confirm the steering wheel and front tires are straight ahead.
6. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Rotate the steering wheel to the right steering lock and the left steering lock.
11. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C2129-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the voltage is below 5.9 volts for greater than 15 seconds.

DEFAULT ACTION

- All switch outputs will be inactive.

POSSIBLE CAUSES

Possible Causes
CHARGING OR VOLTAGE DTCS PRESENT
LOW BATTERY VOLTAGE
FUSED B(+) CIRCUIT HIGH RESISTANCE
GROUND CIRCUIT HIGH RESISTANCE
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)
- **CHECK THE (A238) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
 1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
 2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
 3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
 4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
 5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

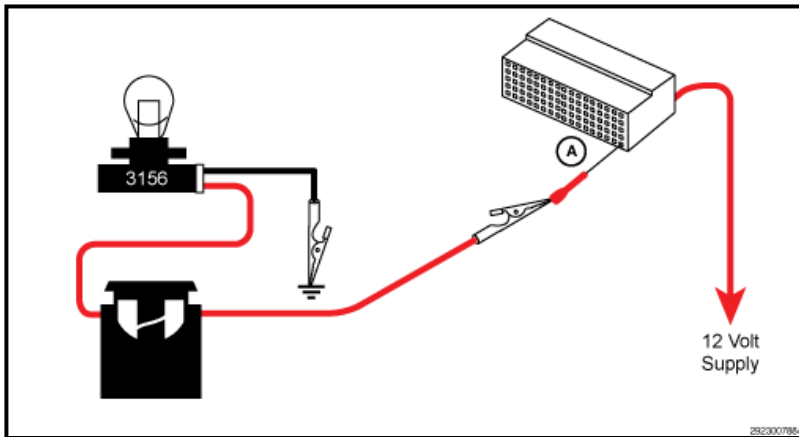
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and

alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the SCCM VERIFICATION TEST. Refer to the appropriate information.
- **CHECK THE (Z911) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
 1. Disconnect the component harness connector to isolate the ground circuit.
 2. Connect the positive lead of the load test tool to the positive side of the Battery.
 3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
 4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a

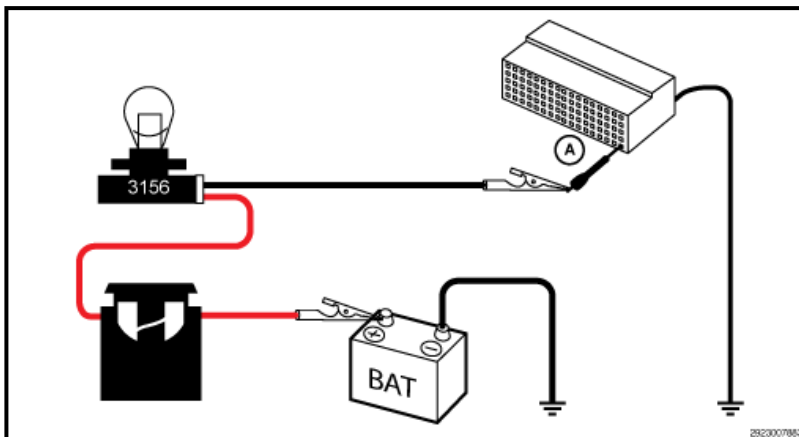
circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).



NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the SCCM VERIFICATION TEST. Refer to the appropriate information.
- **CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -**
 1. Disconnect all SCCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C2129-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

WHEN MONITORED

- This diagnostic runs continuously when the Engine is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the voltage is above 16 volts for greater than 15 seconds.

DEFAULT ACTION

- All switch outputs will be inactive.

POSSIBLE CAUSES

Possible Causes
CHARGING OR VOLTAGE DTCS PRESENT
HIGH BATTERY VOLTAGE
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCS.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.

2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L\(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)
- **CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -**
 1. Disconnect all SCCM harness connectors.
 2. Disconnect all related in-line harness connections (if equipped).
 3. Disconnect the related component harness connectors.
 4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

C212A-16-SYSTEM VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) internal power supply is below 10 volts for more than 15 seconds.

DEFAULT ACTION

- All switch outputs will be inactive.

POSSIBLE CAUSES

Possible Causes
CHARGING OR VOLTAGE DTCS PRESENT
LOW BATTERY VOLTAGE
FUSED B(+) CIRCUIT OPEN OR EXCESSIVE RESISTANCE
GROUND CIRCUIT OPEN OR EXCESSIVE RESISTANCE
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [2](#)
- **CHECK THE (A238) FUSED B(+) CIRCUIT FOR OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
 1. Disconnect the component harness connector to isolate the Fused B(+) circuit.
 2. Connect the positive lead of the load test tool to the Fused B(+) circuit at the component harness connector (A). **Note:** refer to the diagram below.
 3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
 4. Ensure that the circuit being tested is being powered on. If the circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
 5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .**

NOTE: **Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load**

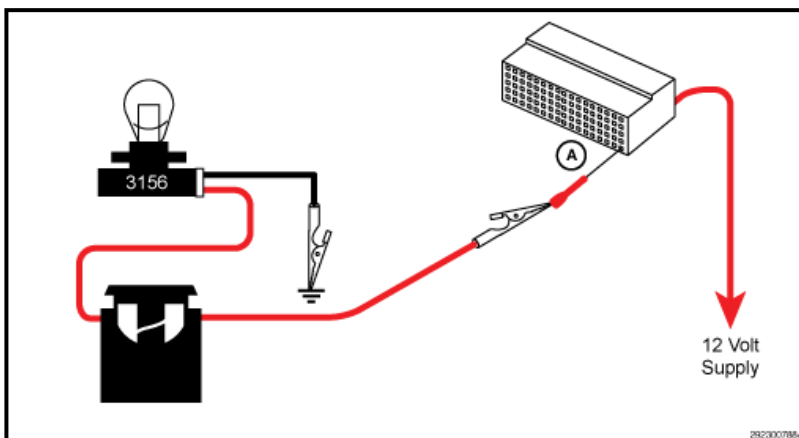
test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE:

When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To the appropriate information

No

- Repair the Fused B(+) circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

- **CHECK THE (Z911) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

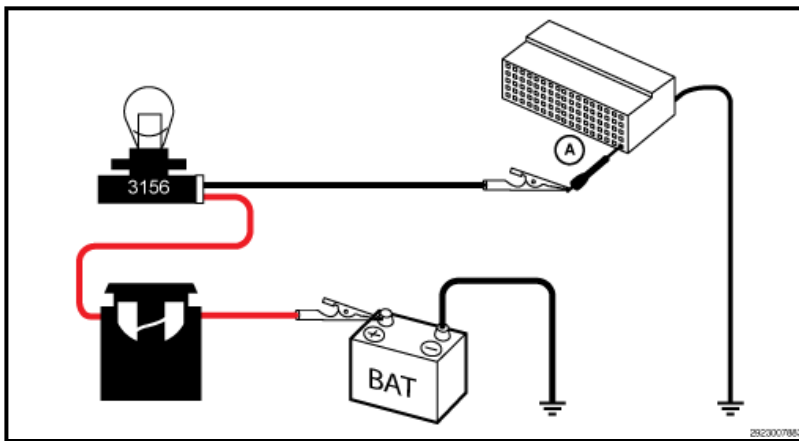
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).
- **CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -**
 1. Disconnect all SCCM harness connectors.
 2. Disconnect all related in-line harness connections (if equipped).
 3. Disconnect the related component harness connectors.
 4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C212A-17-SYSTEM VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

WHEN MONITORED

- This diagnostic runs continuously when the Engine is on.

SET CONDITION

- The Steering Column Control Module (SCCM) internal power supply is above 16 volts for more than 15 seconds.

DEFAULT ACTION

- All switch outputs will be inactive.

POSSIBLE CAUSES

Possible Causes
CHARGING OR VOLTAGE DTCS PRESENT
HIGH BATTERY VOLTAGE
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK FOR CHARGING OR VOLTAGE RELATED DTC(S) PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)

3. Make sure the Battery and Generator Drive Belt are in good condition.

Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Inspect the fuses in the Power Distribution Center (PDC) Assembly. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

1. Start the Engine.
2. With the scan tool, read PCM DTCs and record on the repair order.

Are there any charging system or battery voltage related DTCs present?

Yes

- Repair the Powertrain Control Module (PCM) DTCs before continuing with this test. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#), or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [2](#)
- **CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -**
 1. Disconnect all SCCM harness connectors.
 2. Disconnect all related in-line harness connections (if equipped).
 3. Disconnect the related component harness connectors.
 4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C2205-00-STEERING ANGLE SENSOR INTERNAL

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Steering Angle Sensor (SAS) for this vehicle is integral to the Steering Column Control Module (SCCM).

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Steering Angle Sensor (SAS) has set an internal failure.

DEFAULT ACTION

- The SAS will be inactive.

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. DISCONNECT RELATED MODULE HARNESS CONNECTIONS - INSPECT FOR PROBLEMS - CONNECT RELATED MODULE HARNESS CONNECTIONS - ERASE DTCS AND CHECK IF DTC TO RETURNS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

C2205-29-STEERING ANGLE SENSOR INTERNAL-SIGNAL INVALID

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Steering Angle Sensor (SAS) for this vehicle is integral to the Steering Column Control Module (SCCM).

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Steering Angle Sensor (SAS) has set an internal failure.

DEFAULT ACTION

- The SAS will be inactive.
- ESP is turned off

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C2205-2F-STEERING ANGLE SENSOR INTERNAL-SIGNAL ERRATIC

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Steering Angle Sensor (SAS) for this vehicle is integral to the Steering Column Control Module (SCCM).

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Steering Angle Sensor (SAS) has set an internal failure.

DEFAULT ACTION

- The SAS will be inactive.

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C2205-41-STEERING ANGLE SENSOR INTERNAL-GENERAL CHECKSUM FAILURE

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Steering Angle Sensor (SAS) for this vehicle is integral to the Steering Column Control Module (SCCM).

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Steering Angle Sensor (SAS) has set an internal failure.

DEFAULT ACTION

- The SAS will be inactive.
- ESP will be off

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
- Test complete.

C2205-96-STEERING ANGLE SENSOR INTERNAL-COMPONENT INTERNAL FAILURE

For a complete SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Steering Angle Sensor (SAS) for this vehicle is integral to the Steering Column Control Module (SCCM).

WHEN MONITORED

- This diagnostic runs continuously when the ignition is on.

SET CONDITION

- The Steering Column Control Module (SCCM) detects the Steering Angle Sensor (SAS) has set an internal failure.

DEFAULT ACTION

- The SAS will be inactive.
- ESP will be off

POSSIBLE CAUSES

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to [MODULE, STEERING COLUMN CONTROL \(SCCM\), REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
- Test complete.

U0001-00-CAN C BUS

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0401-00-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0423-00-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U1008-00-LIN 1 BUS

For a complete SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 10 and 16 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) detects a short on the LIN Bus circuit for greater than five seconds.

DEFAULT ACTION

- The Left Steering Wheel Switches will be inactive.

POSSIBLE CAUSES

Possible Causes
LIN BUS CIRCUIT SHORTED TO VOLTAGE
LIN BUS CIRCUIT SHORTED TO GROUND
LEFT STEERING WHEEL SWITCH
STEERING COLUMN CONTROL SWITCH (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. DISCONNECT THE LEFT STEERING WHEEL SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Left Steering Wheel Switch in accordance to the Service Information. Refer to [SWITCH, REMOTE RADIO, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (D594) LIN BUS CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. If not currently disconnected, disconnect the component harness connector for the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D594) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (A92) FUSED B(+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

6. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS -

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .
- Test complete.

U121E-00-LOST COMMUNICATION WITH STEERING WHEEL CRUISE CONTROL SWITCH

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Steering Column Control Module (SCCM) is located near the top of the Steering Column underneath the Steering Wheel. The SCCM includes the Clockspring, the Multi-Function Switch and a LIN/CAN C Gateway. LIN Bus messages received by the LIN/CAN C Gateway are broadcast over the CAN C Bus to the appropriate modules.

The Right Steering Wheel Switch (Speed Control Switch) communicates with the Steering Column Control Module (SCCM) through a dedicated LIN Bus. When the SCCM receives a LIN Bus message from the Right Steering Wheel Switch, the SCCM will send a message over the CAN C Bus to the appropriate modules.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The ignition is on.
- The Battery voltage is between 10 and 16 volts.

SET CONDITION

- The Steering Column Control Module (SCCM) does not detect any communication with the Right Steering Wheel Switch (Speed Control) for greater than five seconds.

DEFAULT ACTION

- The Speed Control Switch will be inactive.

POSSIBLE CAUSES

Possible Causes
LIN BUS CIRCUIT SHORTED TO VOLTAGE
LIN BUS CIRCUIT SHORTED TO GROUND
RIGHT STEERING WHEEL SWITCH (SPEED CONTROL)
STEERING COLUMN CONTROL SWITCH (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a vehicle Scan Report, or record the Environmental Data related to the DTCs.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read Steering Column Control Module (SCCM) DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. DISCONNECT THE RIGHT STEERING WHEEL SWITCH HARNESS CONNECTOR - ERASE DTCS AND CHECK IF DTC RETURNS

1. Turn the ignition off.
2. Disconnect the component harness connector(s) containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the Right Steering Wheel Switch (Speed Control) in accordance to the Service Information. Refer to [SWITCH, SPEED CONTROL, REMOVAL AND INSTALLATION](#) .
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (D592) LIN BUS CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. If not currently disconnected, disconnect the component harness connector for the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

Is there any voltage present?

Yes

- Repair the circuit for a short to voltage.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (D592) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting all Electronic Control Unit (ECU) and component harness connectors containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. Connect the positive lead of the DVOM to the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When probing a circuit at any harness connector, always use an appropriate probing tool to prevent any possible damage to the harness connector pins.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE (A92) FUSED B(+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

6. CHECK SCCM AND RELATED MODULE HARNESS CONNECTIONS

1. Disconnect all SCCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect all SCCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read SCCM DTCs.

Did the DTC return?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION**.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.
 - Test complete.
-

2021 ACCESSORIES AND BODY, CAB

Vehicle Theft Security (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

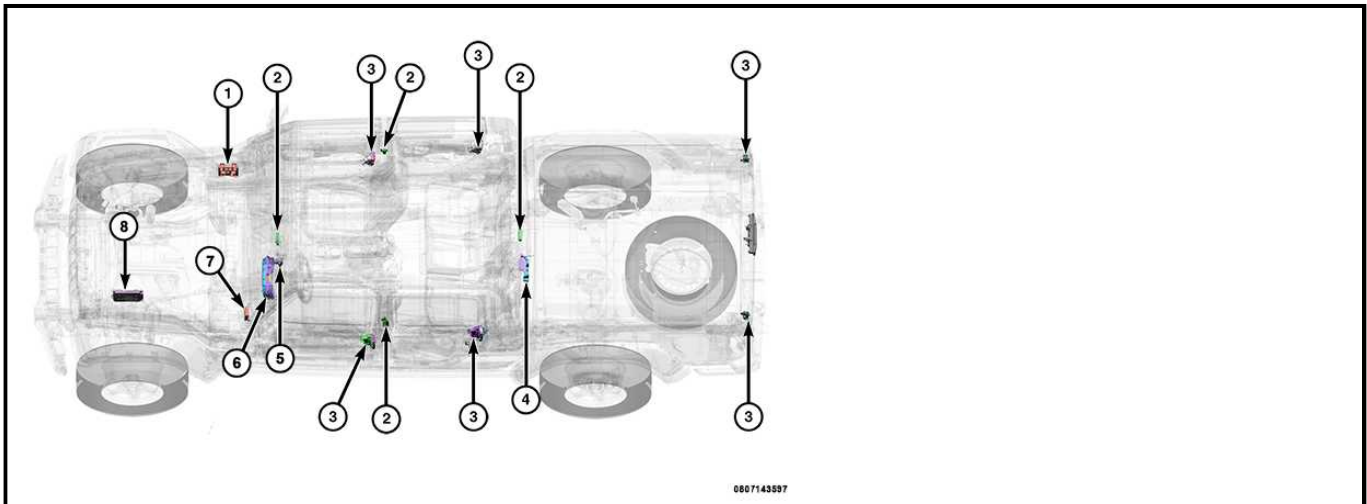
DESCRIPTION

The Vehicle Theft Security System (VTSS) includes various features that provide protection against unauthorized vehicle access and operation. VTSS is comprised of two primary subsystems:

- Vehicle Theft Alarm (VTA)
- Immobilizer System

DESCRIPTION - VEHICLE THEFT ALARM

DESCRIPTION - VEHICLE THEFT ALARM



The VTA is factory-installed equipment on this vehicle and includes the following major components:

COMPONENT INDEX

1	Refer to <u>BODY CONTROL MODULE (BCM).</u>
2	Refer to <u>LOW FREQUENCY (LF) ANTENNA.</u>
3	Refer to <u>DOOR, HOOD, AND TAILGATE AJAR SWITCHES.</u>
4.	Refer to <u>RADIO FREQUENCY HUB (RFH).</u>
5	Refer to <u>KEYLESS IGNITION NODE (KIN).</u>
6	Refer to <u>INSTRUMENT PANEL CLUSTER (IPC)</u> - Security Indicator Display.
7	Refer to <u>ELECTRONIC STEERING LOCK (ESL).</u>
8	Refer to <u>POWERTRAIN CONTROL MODULE (PCM).</u>

The VTA is designed to provide either active or passive perimeter protection of the vehicle by monitoring the vehicle doors, the ignition status, the tailgate, the hood and the power lock switches. If the VTA system detects any attempt to compromise a monitored vehicle system or feature, the vehicle horn is pulsed as an audible deterrent and certain exterior lamps are flashed as a visual deterrent.

The BCM, the IPC and the RFH each contain an internal controller and programming that allow them to communicate with each other and other electronic modules in the vehicle using the CAN-C data bus. In addition, in vehicles equipped with PEKG the RFH and the BCM communicate with each other using a LIN data bus. Refer to **COMMUNICATION, DESCRIPTION AND OPERATION** .

OPERATION

The BCM includes the logic and control circuits for the VTA. Each of the ajar switches provides hard wired inputs to the BCM, while the BCM provides control outputs to the vehicle horns and lighting systems. The RFH monitors the status of the KIN through a private security K-line data bus and relays this information to the BCM as electronic messages transmitted over the CAN-C data bus.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the VTA operating modes.

- **Enabling** - The BCM and the RFH must have the VTA function electronically enabled in order for the VTA to perform as designed.
- **Alarm** - The VTA alarm output provides both visual and audible outputs; however, the time intervals of these outputs vary by the requirements of the market for which the vehicle is manufactured. In all cases, the visual output will be a flashing On and Off of the exterior turn signal lamps, while the audible output of the horn at a rate of 500ms between pulses. The inputs that will trigger the alarm include a change in the status of the ignition, the door ajar switches, the tailgate ajar switch and, the hood ajar switch.
- **Arming** - Arming of the VTA occurs when the vehicle is exited and the key is removed from the ignition (without PEKG) and the switch status is OFF or the status of the KIN (with PEKG) is OFF, the exterior lighting is turned Off, then the Lock button on the Remote Keyless Entry (RKE) transmitter is depressed or the Lock button on the Passive Entry (PE) is pressed to lock the vehicle. For active arming to occur, the doors and the tailgate must be closed and the status of the ignition switch or the KIN must be Off when the RKE transmitter or PE handle Lock button is depressed. Arming will not occur if a key is in the ignition switch lock cylinder or a key fob is within the vehicle interior.

Pre-arming of the VTA is initiated when a door or the tailgate is open when the vehicle is locked using a power door lock switch or when the RKE Lock button is pressed. Pre-arming will not occur if a key fob is within the vehicle interior. When the VTA is pre-armed, the arming sequence is delayed until all of the doors and the tailgate have been closed. The VTA will remain in pre-armed mode for up to 16 seconds after all doors and the tailgate have been closed.

Once the VTA begins the arming sequence, the security indicator in the IPC will flash rapidly for about 16 seconds. This indicates that VTA arming is in progress. If the status of the ignition switch changes, if a door or the tailgate is unlocked or opened by any means, the security indicator will stop flashing and the arming process will abort. Once the arming sequence is successfully completed, the security indicator will flash at a slower rate, indicating that the VTA is armed.

The VTA arming sequence will occur regardless of whether a door or the tailgate is open or closed, but the security indicator will illuminate solid and the open door or the tailgate will not be protected unless the door or the tailgate is closed when the VTA arming sequence first begins.

On vehicles equipped with the hood ajar switch, the VTA arming sequence will occur regardless of whether the hood is open or closed, but the security indicator will illuminate solid and the engine compartment will not be protected unless the hood is closed when the VTA arming sequence first begins. Also, if the status of the hood ajar switch changes from open to closed during the 16 second arming process, the security indicator will switch from solid to flashing. Once the arming process is successfully completed, the security indicator will flash at a slower rate, indicating that the VTA is armed.

- **Disarming** - Passive disarming of the VTA occurs when the vehicle is unlocked by depressing the Unlock button of the RKE transmitter. Once the alarm has been activated, this disarming method will also deactivate the alarm. Unlocking a door with a key will **not** disarm the VTA or deactivate the alarm. On vehicles equipped with PE, if one of the valid key fob units is located outside the vehicle and within 1.5 meters (5 feet) of the driver or passenger front door handles, grab the PE handle and enter the vehicle, then press the Engine Start/Stop Button (ESS) to transition the ignition status to ON. This requires at least one valid key fob be located within the passenger compartment of the vehicle.
- **Power-Up Mode** - When the armed VTA senses that the battery has been disconnected and reconnected, it enters its power-up mode. In the power-up mode the armed alarm system remains armed following a

battery failure or disconnect. If the VTA was armed prior to a battery disconnect or failure, the technician or vehicle operator will have to disarm the alarm system after the battery is reconnected. The power-up mode will also apply if the battery goes dead while the system is armed, and battery jump-starting is attempted. The VTA will be armed until the technician or vehicle operator has disarmed the alarm system. If the VTA is in the disarmed mode prior to a battery disconnect or failure, it will remain disarmed after the battery is reconnected or replaced, or if jump-starting is attempted.

- **Tamper Alert** - The VTA tamper alert feature will sound the vehicle horn with three horn chirps with 500ms between chirps. This feature alerts the vehicle operator that the VTA alarm was activated while the vehicle was unattended.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

The BCM includes the logic and control circuits for the VTA. Each of the ajar switches provides hard wired inputs to the BCM, while the BCM provides control outputs to the vehicle horns and lighting systems. In vehicles not equipped with the optional PEKG system, the BCM also monitors the status of the ignition switch through a hard wired input. In vehicles equipped with the PEKG system, the RFH monitors the status of the KIN through a private security K-line data bus and relays this information to the BCM as electronic messages transmitted over the CAN-C data bus.

Inputs:

- Key in ignition status
- All door, tailgate and hood ajar switch status
- Power mode status
- Key status
- Operation mode status
- Intrusion attempt status
- Remote start activity

Outputs:

- Audio alert initiation
- Alarm indication to IPC
- Theft alarm status on CAN-C data bus
- Alarm cause status on CAN-C data bus
- Lighting alert initiation
- Theft alarm status to the RFH

The BCM reads all hard wired ajar switch inputs through an internal pull-up resistor, then uses this input to control other electronic functions and features of the vehicle. The BCM may also send electronic **ajar switch status** to other electronic modules in the vehicle over the CAN-C data bus.

DOOR, HOOD, AND TAILGATE AJAR SWITCHES

DOOR, HOOD, AND TAILGATE AJAR SWITCHES

Refer to [COMPONENT INDEX](#).

The ajar switches are actuated by the latch mechanism and the latch striker. When the door, tailgate and hood are closed and properly latched, the ajar switches are open circuits. When the entry point is open or only partially unlatched, the ajar switch is a closed circuit. The ajar switches are hard wired in series between ground and a signal circuit of the BCM.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [COMPONENT INDEX](#).

Vehicles with this equipment can be readily identified by the illumination of the security indicator in the IPC for about three seconds after the status of the ignition transitions to ON as a security bulb test. The IPC will also respond to the electronic **invalid key** message on the CAN-C data bus by flashing the security indicator ON and OFF.

KEYLESS IGNITION NODE (KIN)

KEYLESS IGNITION NODE (KIN)

Refer to [COMPONENT INDEX](#).

In vehicles equipped with the optional PEKG system, an active VTA alarm can be disarmed if a valid key fob is present inside the vehicle and the KIN transitions from OFF to RUN. If a valid key fob is not detected by the RFH and communicated by the RFH to the BCM, the alarm will continue to be active.

In vehicles not equipped with the optional PEKG system, an active VTA alarm can be disarmed if a valid key fob is used to transition the ignition state from OFF to RUN. If a valid key fob is not detected by the RFH and communicated to the BCM, the alarm will continue to be active.

LOW FREQUENCY (LF) ANTENNA

LOW FREQUENCY (LF) ANTENNA

Refer to [COMPONENT INDEX](#).

When the status of the ignition transitions to ON, a hard wired input is sent to the BCM and an electronic message input is sent to the RFH over a dedicated security K-line data bus. The RFH relies upon four LF antenna units to challenge the key fob using a LF signal, then monitors responses from the key fob received as Very High Frequency (VHF) signals. The RFH determines whether a valid key fob is present based upon the response from the transponder.

If a valid key fob is detected, an electronic **valid key** message is broadcast by the RFH over the CAN-C data bus, and the alarm will be disarmed. If the PCM receives an electronic **invalid key** message from the BCM or the RFH, or receives no message from the BCM or the RFH over the CAN-C data bus, the alarm will continue in the active state.

POWERTRAIN CONTROL MODULE (PCM)

POWERTRAIN CONTROL MODULE (PCM)

Refer to [COMPONENT INDEX](#).

The PCM's roles is defined in alarm deactivation and activation. During key validation, if the PCM receives an electronic **invalid key** message from the BCM or the RFH, or receives no message from the BCM or the RFH over the CAN-C data bus, the alarm will continue in the active state. If the electronic **valid key** message is received, the PCM will allow the alarm system to disarm and the vehicle to start.

RADIO FREQUENCY HUB (RFH)

RADIO FREQUENCY HUB (RFH)

Refer to [COMPONENT INDEX](#).

In vehicles equipped with the optional PEKG system, the RFH transmits the valid or invalid key message on the CAN-C data bus when the ignition transitions from OFF to RUN.

Inputs:

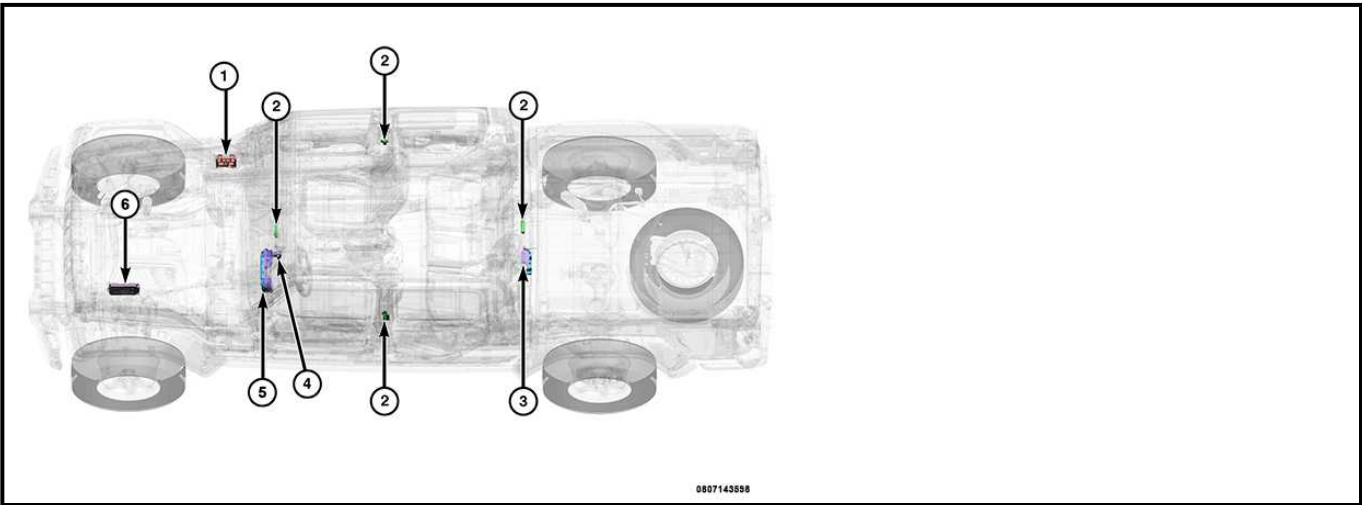
- Key traffic from KIN
- TRM_Code request from BCM
- Ignition and operational mode status
- Odometer total request
- key fob validation request

Outputs:

- TRM_Code response to BCM
- Key ID info
- Key programming status (key fob low battery message)

DESCRIPTION - IMMOBILIZER SYSTEM

DESCRIPTION - IMMOBILIZER SYSTEM



COMPONENT INDEX

1.	Refer to BODY CONTROL MODULE (BCM).
2.	Refer to LOW FREQUENCY (LF) ANTENNA.
3.	Refer to RADIO FREQUENCY HUB (RFH).
4.	Refer to KEYLESS IGNITION NODE (KIN).
5.	Refer to INSTRUMENT PANEL CLUSTER (IPC).
6.	Refer to POWERTRAIN CONTROL MODULE (PCM).
-	Refer to KEY FOB WITH INTEGRATED TRANSPONDER CHIP.

OPERATION

This vehicle is using Advanced Encryption Standard (AES) to implement the immobilizer system. Secret codes are stored in the RFH, BCM, and the PCM that allows these modules to execute the MiniKrypt immobilizer routine. The key fobs, via transponder mode only, are married to the RFH.

If the vehicle is remotely started, this is a mode that is recognized by the immobilizer system and it will not being authentication until after the vehicle exits from the remote start mode.

The immobilizer process does not take place until after the Security Gateway Module (SGW) has been successfully authenticated. for information regarding the SGW and its role in vehicle security on this vehicle. Refer to **MODULE, SECURITY GATEWAY (SGW), DESCRIPTION AND OPERATION** .

The immobilizer authentication process is as listed:

1. Start button is pressed

2. The RFH and the LF antennas work together to authenticate the key fob.
3. If the key fob is authenticated as valid, the RFH sends an ignition request signal to the BCM. However if the key fob is not authenticated, this process stops and the BCM does not receive the ignition request signal.
4. When the BCM receives the ignition request signal from the RFH, the BCM initiates the MiniKrypt code exchange with the RFH.
5. RFH responds to the BCM MiniKrypt authentication challenge. If this exchange is unsuccessful, the BCM will stop processing the ignition command. If the exchange was successful, the BCM next determines if ESL is equipped on the vehicle.
6. If the vehicle is equipped with ESL, the BCM will then send an unlock signal to the ESL. If the ESL is not able to successfully unlock, the BCM will stop processing the ignition command. If the ESL is able to successfully unlock, the ESL responds to the ESL unlock challenge.
7. When the BCM receives successful ESL unlock challenge response, the BCM sends a CAN-C ignition run/start command to the PCM and then activates its own internal ignition relays.
8. The PCM initiates a MiniKrypt exchange between it and the BCM based on the run/start signal command sent from the BCM.
9. The BCM responds to the PCM request with a verification acknowledgement, thus allowing the PCM to start the engine. If for any reason that the PCM/BCM MiniKrypt exchange was not successful, the PCM will shut the engine off after two seconds and report this back to the BCM. If the exchange is successful, the engine will continue to run.

If the authentication between the BCM and PCM has failed, an new ignition cycle is required to being the process once again. The PCM will allow up to 6 consecutive engine running attempts before it disables the starter motor and requires that a new key be authenticated.

The BCM controls the IPC immobilizer warning lights. When the ignition state changes to RUN or START, the BCM sends a command to the IPC to illuminate the immobilizer indicator for 3 seconds. The BCM keeps the indicator lamp off unless there is an unsuccessful validation. At this point, the BCM commands the IPC to illuminate the immobilizer indicator.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [**COMPONENT INDEX**](#).

The BCM is concealed behind the passenger kick panel.

Inputs

- Receives requests from the RFH, ESL, and the PCM during the immobilizer authentication challenges.

Outputs

- Outputs and validates authentication validation requests to and from the RFH, ESL, and the PCM.
- Outputs immobilizer illumination commands to the IPC

ELECTRONIC STEERING LOCK (ESL)

ELECTRONIC STEERING LOCK (ESL)

Refer to [**COMPONENT INDEX**](#).

The ESL is a mechanical steering column lock controlled electronically by the BCM and is mounted to the steering column housing.

Inputs

- Receives a request to unlock from the BCM

Outputs

- Sends a signal to the BCM indicating if the unlock request was successful or unsuccessful

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to [COMPONENT INDEX](#).

Inputs

- Receives immobilizer illumination commands from the BCM

Outputs

- KIN backlight illumination interior lamps driver requests

KEY FOB WITH INTEGRATED TRANSPONDER CHIP

KEY FOB WITH INTEGRATED TRANSPONDER CHIP

Refer to [COMPONENT INDEX](#).

A key transponder microchip is located within each key fob. This transponder chip is authenticated the RFH module.

KEYLESS IGNITION NODE (KIN)

KEYLESS IGNITION NODE (KIN)

Refer to [COMPONENT INDEX](#).

The KIN is located in the instrument panel just inboard of the steering column.

Inputs

- Receives the interior lights driver command from the IPC for illumination

Outputs

- Outputs an ignition ACC/START/RUN request to the RFH when actuated

LOW FREQUENCY (LF) ANTENNA

LOW FREQUENCY (LF) ANTENNA

Refer to [COMPONENT INDEX](#).

There are four LF antenna units strategically placed within this vehicle. These LF antennas help the key fob and the RFH communicate and authenticate.

POWERTRAIN CONTROL MODULE (PCM)

POWERTRAIN CONTROL MODULE (PCM)

Refer to [COMPONENT INDEX](#).

The PCM is located on the forward left side of the engine compartment.

Inputs

- Receives an ignition start request from the BCM
- Receives an authentication challenge response from the BCM.

Outputs

- Sends an immobilizer authentication challenge to the BCM.
- Sends an authentication challenge failure to the BCM if immobilizer authentication challenge fails.

RADIO FREQUENCY HUB (RFH)

RADIO FREQUENCY HUB (RFH)

Refer to [COMPONENT INDEX](#).

The RFH is located behind the rear seat attached to the rear close out panel.

Inputs

- Transponder signal from the Key Fob
- RF signals from the LF antenna for key fob validation
- KIN push button ignition requests
- BCM immobilizer authentication requests

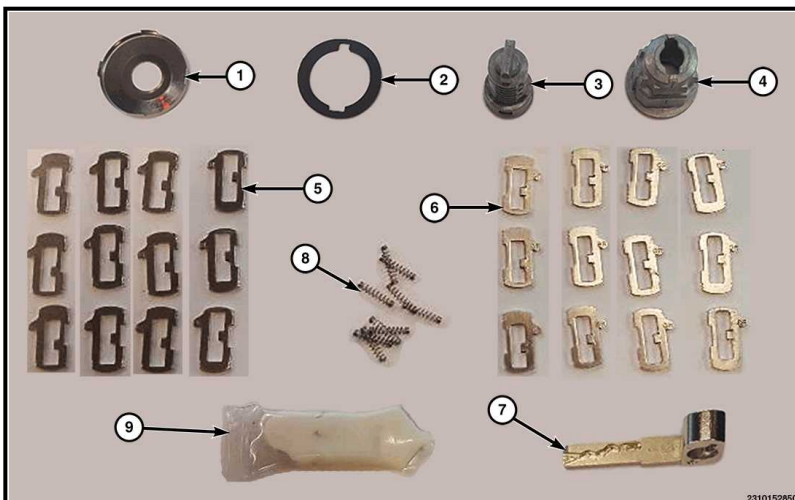
Outputs

- LF antenna key fob validation requests
- Ignition command to the BCM once key fobs are validated
- BCM immobilizer authentication requests

STANDARD PROCEDURE

CODING A LOCK CYLINDER TO EXISTING KEY (HI-SECURITY)

- NOTE:** There will be additional parts leftover once service has been completed.
- NOTE:** The following procedure will be show for a door lock cylinder. All other cylinder coding is similar.
- NOTE:** When marking tumblers for door lock cylinders, there will be seven markings, eight markings for ignition lock cylinders, and four markings for the fuel cap lock cylinder.
- NOTE:** There will be multiples of each tumbler (AL, BL, CL, DL, AR, BR, CR, DR) and they will be Individually bagged



TYPICAL CONTENTS OF LOCK CYLINDER KIT

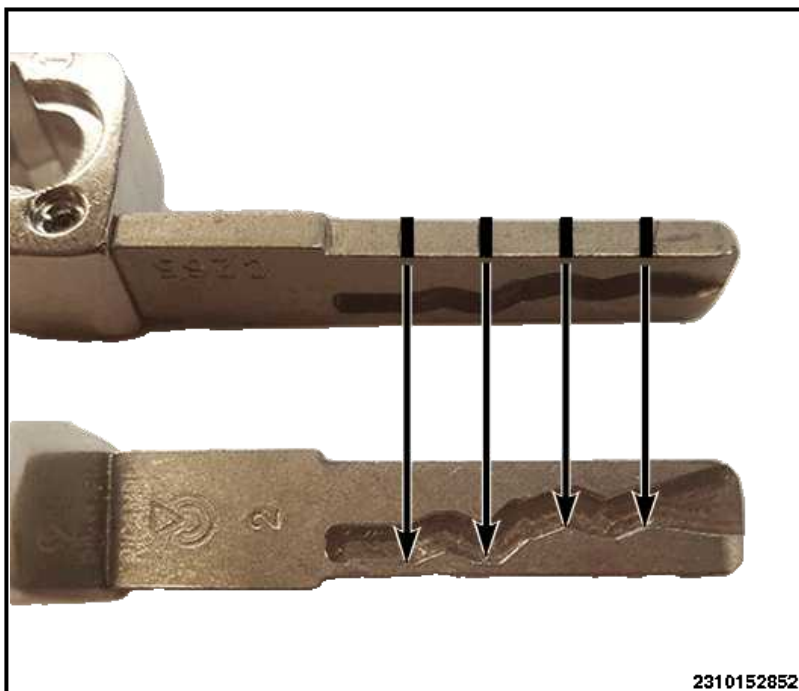
1.	Cap
2.	Gasket
3.	Lock Cylinder Plug
4.	Lock Cylinder Housing
5.	Left Side Tumblers (Marked AL, BL, CL, DL)
6.	Right Side Tumblers (Marked AR, BR, CR, DR)
7.	Existing Key
8.	Tumbler Springs
9.	Lithium Grease



1. Insert an existing key into the lock plug and identify the location of the tumblers (1).

NOTE:

When marking tumblers for door lock cylinders, there will be seven markings, eight markings for ignition lock cylinders, and four markings for the fuel cap lock cylinder.

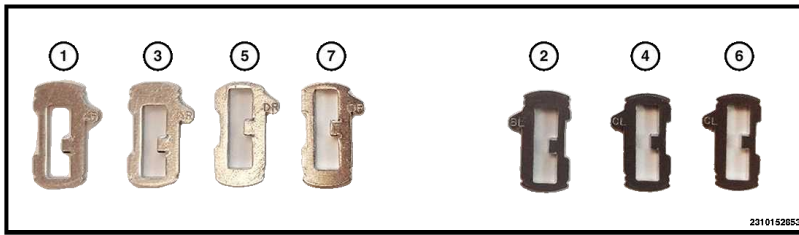


2. Mark tumbler location on key.
3. Remove the key, rotate the cylinder plug and mark the additional notches.

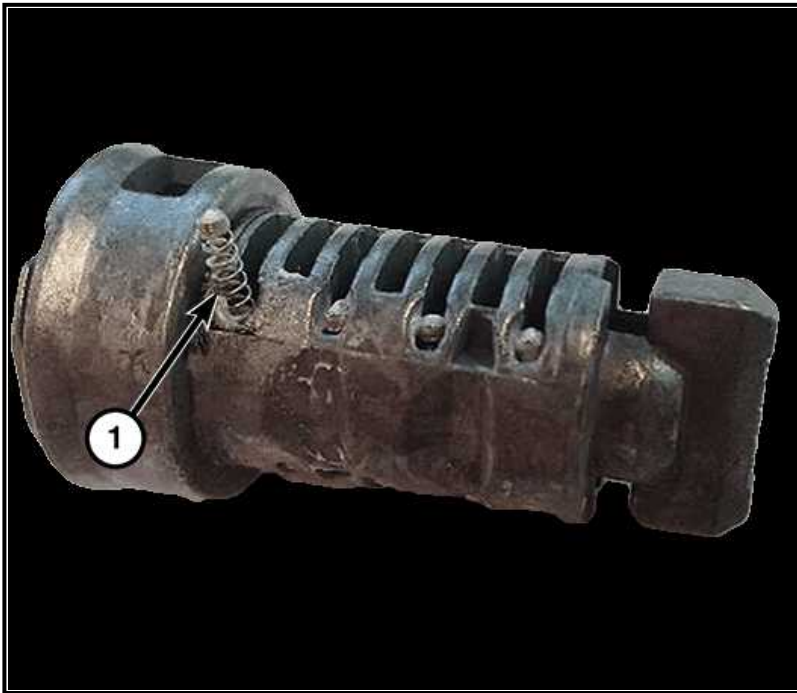
NOTE:

The first side will use the left side tumblers marked AL, BL, CL, DL, the send side will use tumblers marked AR, BR, CR, DR.

4. Determine tumbler depth for each of the locations marked and write them down.



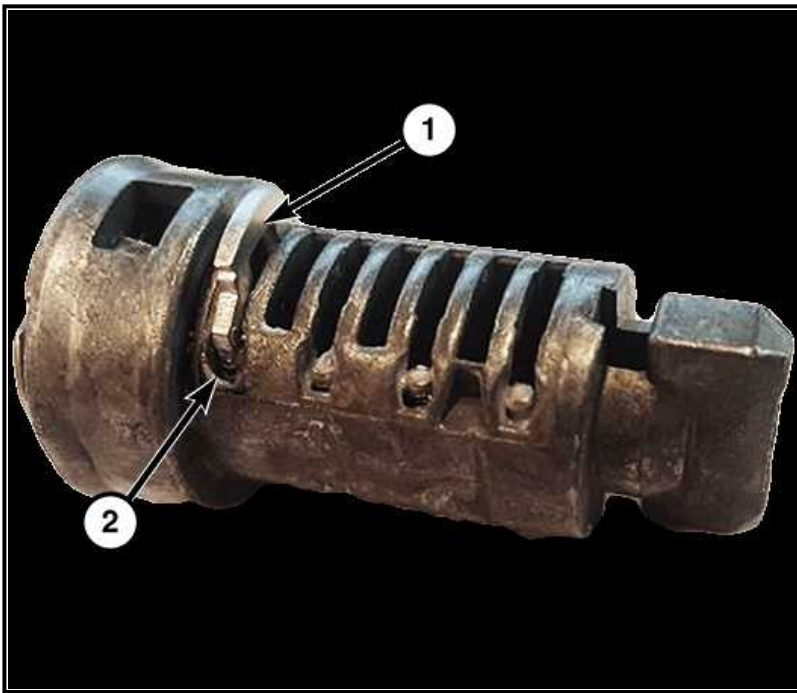
5. Lay out tumblers left to right for first side (Positions 1, 3, 5, 7) and second side (Positions 2, 4, 6) as shown.



6. Apply a small amount of lithium grease on springs (1) and insert springs into the first side.

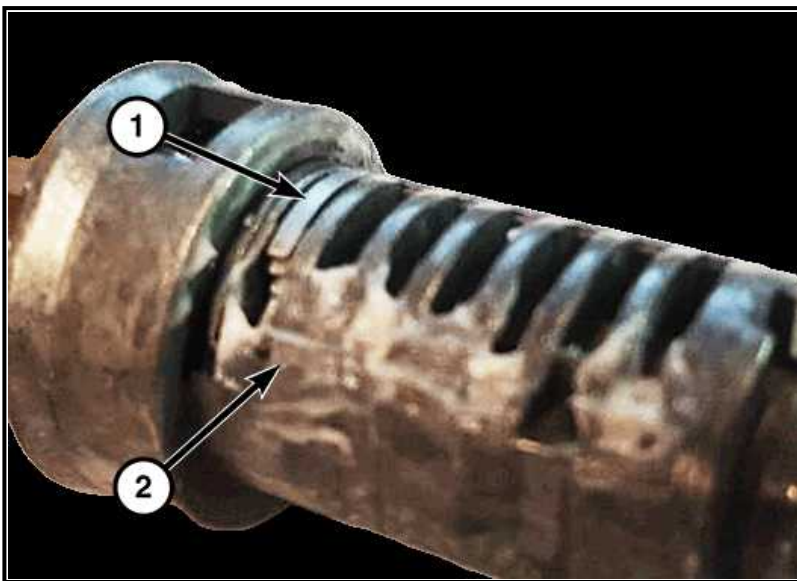


7. With all of the springs are inserted, apply lithium grease on the top side of lock cylinder plug (1) to help prevent them from falling out during assembly.



NOTE: The first side will use the left side tumblers marked AL, BL, CL, DL

8. Starting with position one on the first side, insert the proper tumbler (1) into the lock cylinder plug (2).



9. Insert the key and verify that the tumbler (1) will be flush with cylinder plug (2).

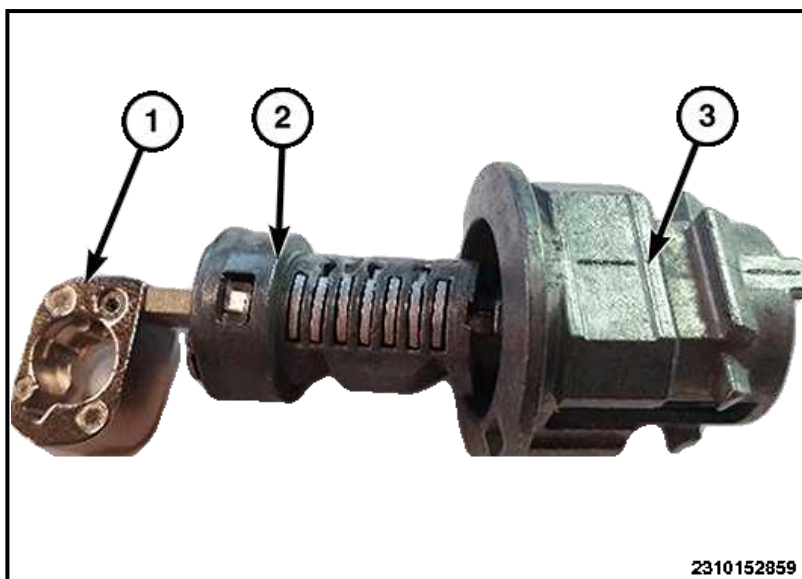


10. Continue down the first side, completing the installation of all tumblers and verification of proper installation (1).

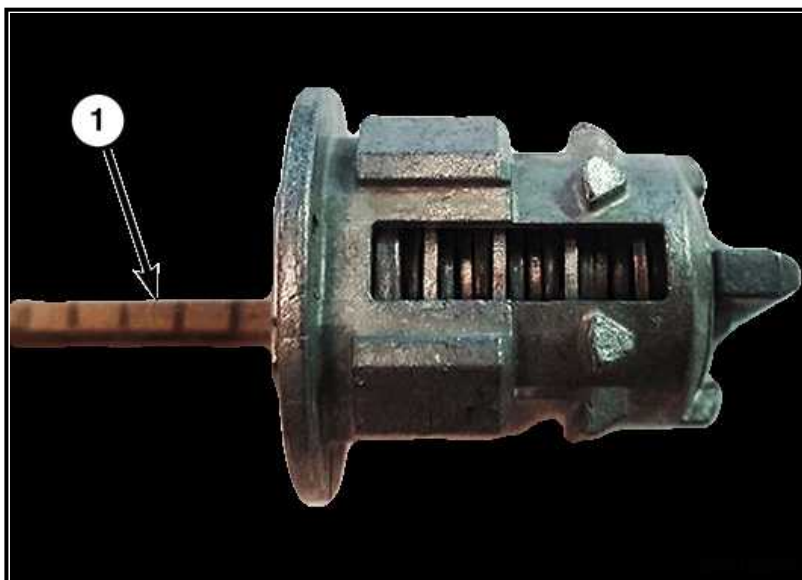
NOTE: The second side will use the right side tumblers marked AR, BR, CR, DR.



11. With the first side completed, hold the installed tumblers loosely to prevent them from falling out, rotate the lock cylinder plug the to second side. Repeat the previous steps for the second side until all positions are filled (1).



12. Insert the key (1) into the lock cylinder plug (2) and position them inside the lock cylinder housing (3).



13. Verify proper operation of the lock cylinder by turning the key (1) and removing it.
14. Remove the marks from the key and continue with cylinder installation.

DIAGNOSIS AND TESTING

SENTRY KEYB® IMMOBILIZER SYSTEM

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired circuits between modules and components related to the Sentry KeyB® Immobilizer System (SKIS) may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the SKIS or the electronic controls and communication between other modules and devices that provide features of the SKIS. The most reliable, efficient and accurate means to diagnose the SKIS or the electronic controls and communication related to SKIS operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

Sentry KeyB® IMMOBILIZER SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
SECURITY INDICATOR FAILS TO LIGHT DURING BULB TEST	1. Ineffective Light-Emitting Diode (LED). 2. Ineffective fuse. 3. Ineffective ground circuit. 4. Ineffective battery feed circuit. 5. Ineffective ignition feed circuit.	1. Use a diagnostic scan tool to perform the Instrument Panel Cluster (IPC) actuator test. Refer to the appropriate diagnostic information. 2. Check the Radio Frequency Hub (RF-Hub) fused B(+) fuse and the fused ignition output (run-start) fuse in the Power Distribution Center (PDC). Replace the fuses, if required. 3. Test and repair the open ground circuit at the connector for the RF-Hub, if required. 4. Test and repair the open battery feed circuit at the connector for the IPC, if required. 5. Test and repair the open ignition feed circuit at the connector for the IPC, if required.
SECURITY INDICATOR FLASHES FOLLOWING BULB TEST	1. Invalid key in the ignition switch lock cylinder or an invalid FOB with Integrated Key (FOBIK). 2. Key-related fault.	1. Remove the invalid key or FOBIK and try again with a known valid key or FOBIK. 2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.

Sentry KeyB® IMMOBILIZER SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
SECURITY INDICATOR LIGHTS SOLID FOLLOWING BULB TEST	1. SKIS system malfunction/fault detected. 2. SKIS system ineffective.	1. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis. 2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.

VEHICLE THEFT ALARM

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The hard-wired circuits between modules and components related to the Vehicle Theft Alarm (VTA) system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

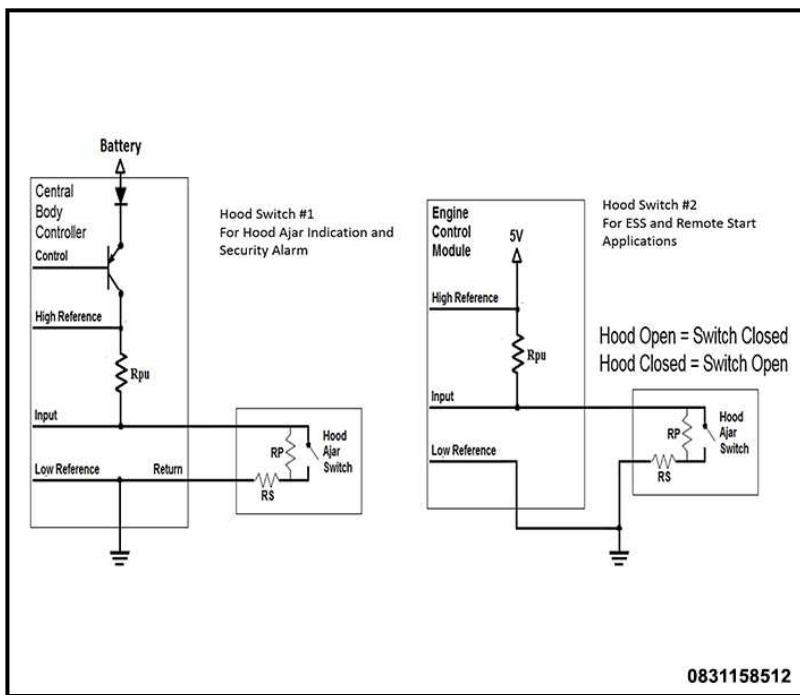
However, conventional diagnostic methods will not prove conclusive in the diagnosis of the VTA or the electronic controls and communication between other modules and devices that provide features of the VTA. The most reliable, efficient and accurate means to diagnose the VTA or the electronic controls and communication related to VTA operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

SWITCH, HOOD AJAR

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HOOD AJAR SWITCH

1. Disconnect and isolate the negative battery cable. Refer to the appropriate service information .
2. Disconnect the pigtail wire harness connector for the hood ajar switch at the hood latch.



3. Check resistance between the two terminals of the hood ajar switch. There should be 500 ohms with the hood latch open, and 1000 ohms with the hood latch closed. If not OK, replace the ineffective hood latch. If OK, go to Step 4.
4. Test the ground circuit between ground and the hood ajar switch for continuity. If not OK, repair the open ground circuit as required. If OK, go to Step 5.
5.
 - For Alarm and Hood Open telltale, test the signal circuit between the hood ajar switch and the Body Control Module (BCM) for continuity to ground. There should be no continuity. If not OK, repair the shorted signal circuit as required. If OK, go to Step 6.
 - For Remote Start or Stop/Start issues, test the signal circuit between the hood ajar switch and the Engine Control Module (ECM) for continuity to ground. There should be no continuity. If not OK, repair the shorted signal circuit as required. If OK, go to Step 6.
6.
 - For Alarm and Hood Open telltale, test the circuit between the hood ajar switch and the BCM for continuity. There should be continuity. If not OK, repair the open circuit as required. If OK, go to Step 7.
 - For Remote Start or Stop/Start issues, test the circuit between the hood ajar switch and the ECM for continuity. There should be continuity. If not OK, repair the open circuit as required. If OK, go to Step 7.
7. Reconnect the negative battery cable, then reconnect the IBS.
8. Use a diagnostic scan tool and the appropriate diagnostic procedure to complete testing of the BCM.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .

NOTE: Both underhood switches are removed the same way.



2. Remove the underhood switch (1) from the mounting bracket.



3. Disconnect the underhood switch wire harness connector. Remove the underhood switch from the vehicle.

INSTALLATION

1. Connect the underhood switch wire harness connector to the underhood switch.
 2. Position the underhood switch in the mounting bracket press down until fully seated in the bracket.
 3. Connect the negative battery cable(s). Refer to the appropriate service information .
-

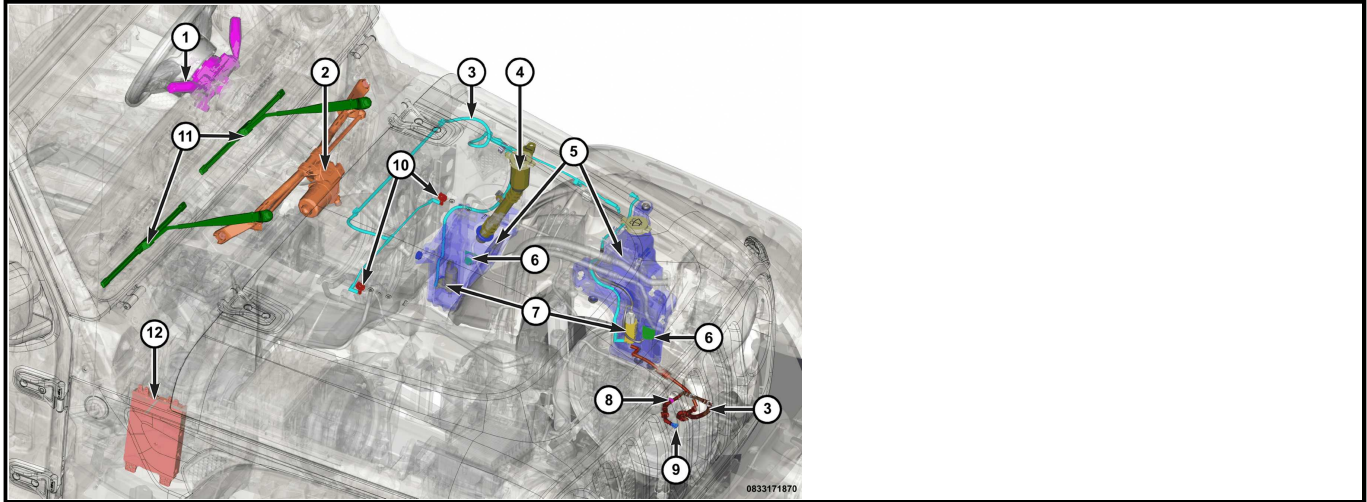
2021 ACCESSORIES AND BODY, CAB

Wiper System & Washer System (Service Information) - Gladiator

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The wiper system consists of the following components:

COMPONENT INDEX

1.	Activation controls on the Refer to <u>STEERING COLUMN CONTROL MODULE (SCCM)</u> .
2.	Refer to <u>WIPER MOTOR AND LINKAGE</u> .
3.	Refer to <u>WASHER FLUID HOSES AND TUBES</u> .
4.	Refer to <u>WASHER FLUID RESERVOIR FILLER NECK AND CAP</u> separate if equipped with 3.0L diesel engine
5.	Refer to <u>WASHER FLUID RESERVOIR</u> .
6.	Refer to <u>WASHER FLUID LEVEL SWITCH</u> .
7.	Refer to <u>SINGLE OR TWO-WAY WASHER PUMP</u> .
8.	Refer to <u>FRONT VIEW CAMERA (FVC) NOZZLE CHECK VALVE</u> .
9.	Refer to <u>FRONT VIEW CAMERA (FVC) NOZZLE</u> .
10.	Refer to <u>WASHER FLUID NOZZLES WITH INTEGRAL CHECK VALVES</u> .
11.	Refer to <u>WIPER ARMS AND BLADES</u> .
12.	Refer to <u>BODY CONTROL MODULE (BCM)</u> .

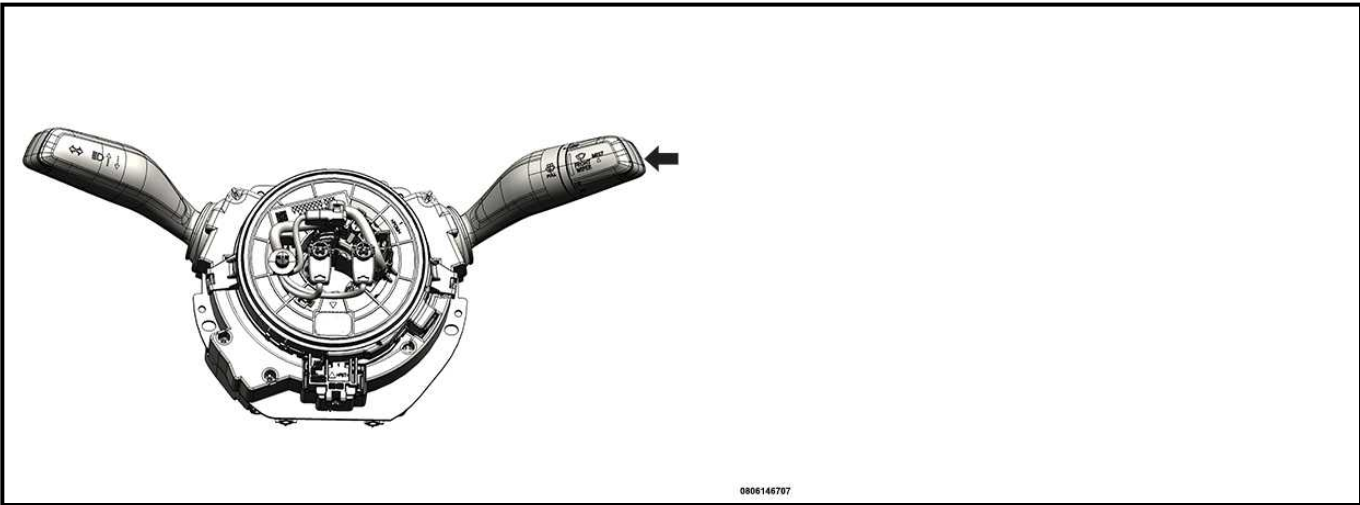
Front wipers and washers are standard equipment on this vehicle. The wiper and washer system is controlled by the right stalk of the SCCM which sends MUX signal inputs to the BCM via a Local Interface Network (LIN) to determine what function or functions of the system are activated or deactivated. The BCM controls the wiper and washer system by providing High Side Driver (HSD) inputs to the relays in the Power Distribution Center (PDC) which activate the electric motor that drives the wiper when selected by the driver. The wiper motor and relays are protected by a 30 amp fuse located in the PDC.

The BCM directly controls the washer pump motor and the washer pump motor is protected by the BCM internal circuitry. The washer pump is a reversible pump used to provide washer fluid to the windshield or the FVC, if equipped, when activated.

OPERATION

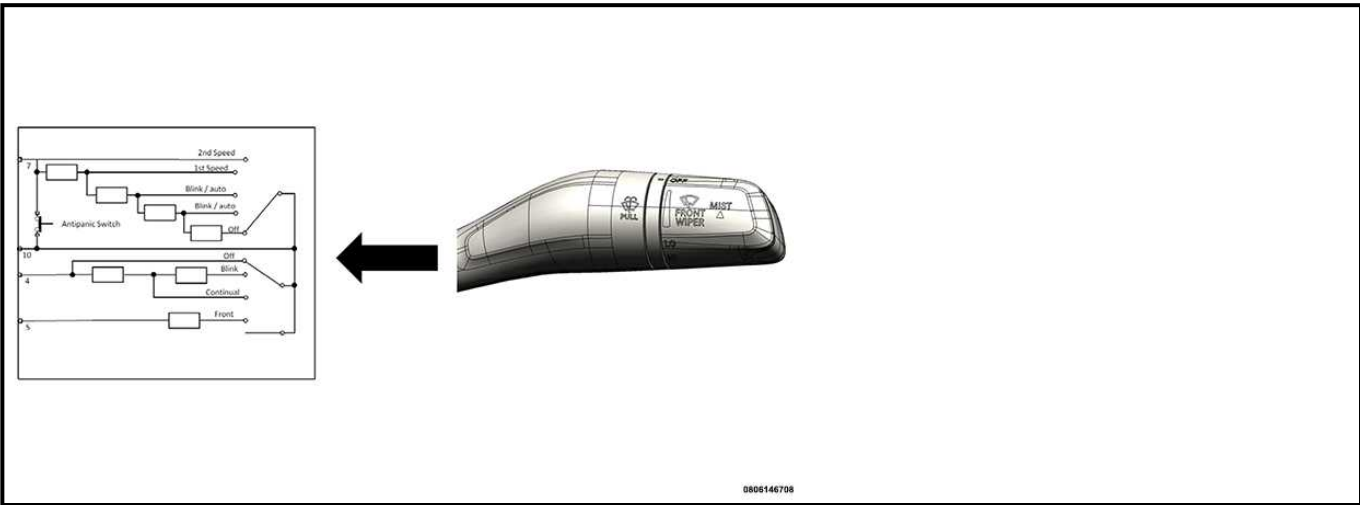
Operating wiper/washer conditions.

Ignition switch status	Function that can be activated
OFF	Servicing position
ON	Front wiper Windshield washer circuit
START	Windshield wiper - cut-off Windshield washer circuit - cut-off



Wiper activation controls on the right stalk of the SCCM.

The windshield wiper functions can be activated via the controls on the right stalk of the SCCM.



The control on the right stalk of the SCCM is electrically connected to the BCM. The BCM receives MUX signals (different levels of resistance according to the position of the lever) from the right stalk of the SCCM.

The BCM controls the windshield wiper motor through relays located in the PDC.

The BCM directly activates the electric motor of the washer pump circuit in accordance with the command from the right stalk of the SCCM.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to [COMPONENT INDEX](#).

Inputs

- Front wiper request
- Washer request

- External temperature
- Remote start activity
- Front wiper cam info
- Washer fluid level
- Power mode status
- Ignition status
- Vehicle speed
- Auto start info

Outputs

- Wiper status
- Wiper motor command
- Washer pump command
- Front wiper movement status
- Front wiper motor status
- SCCM status
- Washer fluid level low

FRONT VIEW CAMERA (FVC) NOZZLE

FRONT VIEW CAMERA (FVC) NOZZLE

Refer to [COMPONENT INDEX](#).

Vehicles equipped with the FVC include a washer nozzle specifically designed to wash the front view camera lens whenever the FVC wash soft key on the radio touchscreen is activated. Pressing the soft key on the radio touchscreen sends a CAN message from the radio to the Central Vision Processing Module (CVPM), which in turn sends a CAN message to the BCM to activate the two-way washer pump in the FVC direction. Pressurized washer fluid is fed to the nozzle from the washer reservoir by the washer pump/motor unit through a single hose, which is attached to a barbed nipple on the washer nozzle behind the front grille.

FRONT VIEW CAMERA (FVC) NOZZLE CHECK VALVE

FRONT VIEW CAMERA (FVC) NOZZLE CHECK VALVE

Refer to [COMPONENT INDEX](#).

Vehicles equipped with the FVC and washer nozzle have a check valve installed in the front view camera washer hose, approximately 102-152 mm (4-6 in) behind the nozzle. The check valve prevents washer fluid from draining out of the washer supply hose back to the washer reservoir. This drain-back would result in a lengthy delay after the washer switch is actuated until washer fluid was dispensed through the nozzle, because the washer pump would have to refill the washer plumbing from the reservoir to the nozzle. Such a drain-back condition could also result in water, dirt, or other outside contaminants being siphoned into the washer system through the washer nozzle orifice. This water could subsequently freeze and plug the nozzle, while other contaminants could interfere with proper nozzle operation and cause improper nozzle spray patterns. In addition, the check valve prevents washer fluid from siphoning through the washer nozzle after the washer system is turned OFF.

When the washer pump pressurizes and pumps washer fluid from the reservoir through the washer plumbing, the fluid pressure unseats a diaphragm from over a sump well within the nozzle by overriding the spring pressure applied to it by a piston. With the diaphragm unseated, washer fluid is allowed to flow toward the nozzle orifice. When the washer pump stops operating, the spring pressure on the piston seats the diaphragm over the sump well in the nozzle and fluid flow in either direction within the washer plumbing is prevented.

SINGLE OR TWO-WAY WASHER PUMP

SINGLE OR TWO-WAY WASHER PUMP

Refer to [COMPONENT INDEX](#).

This vehicle can be equipped with either a single direction washer pump or two-way washer pump. The single direction washer pump is used on vehicles not equipped with a front view camera, while the two-way washer pump is used on vehicles equipped with a front view camera.

The washer pump is located in a sump area near the bottom on the inboard side of the reservoir (LHD) or outboard side of the reservoir (RHD), except those that are equipped with a 3.0L diesel engine. On models equipped with the 3.0L diesel engine, the washer pump is located near the bottom of the rearward side of the washer reservoir.

The two-way washer pump features a reversible electric motor. The direction of the motor is controlled by hardwired outputs from the BCM. When battery current and ground are applied to the two pump motor terminals, the motor rotates in one direction. When the polarity of these connections is reversed, the motor rotates in the opposite direction. When the pump motor is energized, the rotor-type pump pressurizes the washer fluid and forces it through the appropriate pump outlet nipple and into the front or rear washer plumbing. The BCM controls the hardwired outputs to the pump motor based upon hardwired resistor multiplexed inputs received from the front and rear washer switch circuitry contained within the right (wiper) multifunction switch.

Washer fluid is drawn through the pump inlet nipple from the washer reservoir to the inlet port of the washer pump housing. An integral valve body is located in a housing on the outlet port side of the pump housing. A diaphragm in this valve body controls which washer system plumbing receives the washer fluid being pressurized by the pump. When the pump impeller rotates, the pressurized washer fluid is pushed out through the pump outlet port and the washer outlet nipple.

On models that are equipped with the optional FVC, the washer pump is a two-way pump that supplies washer fluid to the camera lens nozzle whenever the washer pump is activated by a CAN message from the CVPM to the BCM. The soft key can be pressed for up to 20 seconds and the washer will continue to pump fluid to the FVC. If the soft key on the radio touchscreen is pressed and held for more than 20 seconds, the CVPM deactivates the BCM and the washer pump will stop running. The pump can be activated again by pressing the soft key again.

The CVPM will display the Clean Camera soft key on the radio touchscreen and will be functional when the BCM has not sent an error message to the CVPM. If the BCM sends an error message to the CVPM, the Clean Camera soft key will be non-functional and grayed out on the radio touchscreen.

STEERING COLUMN CONTROL MODULE (SCCM)

STEERING COLUMN CONTROL MODULE (SCCM)

Refer to [COMPONENT INDEX](#).

The wiper (right) multifunction switch of the SCCM uses resistor multiplexing to control the many functions and features it provides using a minimal number of hardwired circuits. The switch receives clean grounds from the BCM, then provides resistor multiplexed return outputs to the BCM to indicate the selected switch positions via a LIN bus. The BCM then sends hardwired control outputs as well as electronic **switch status** messages over the Controller Area Network - Internal High Speed (CAN-IHS) data bus to other electronic modules in the vehicle.

WASHER FLUID HOSES AND TUBES

WASHER FLUID HOSES AND TUBES

Refer to [COMPONENT INDEX](#).

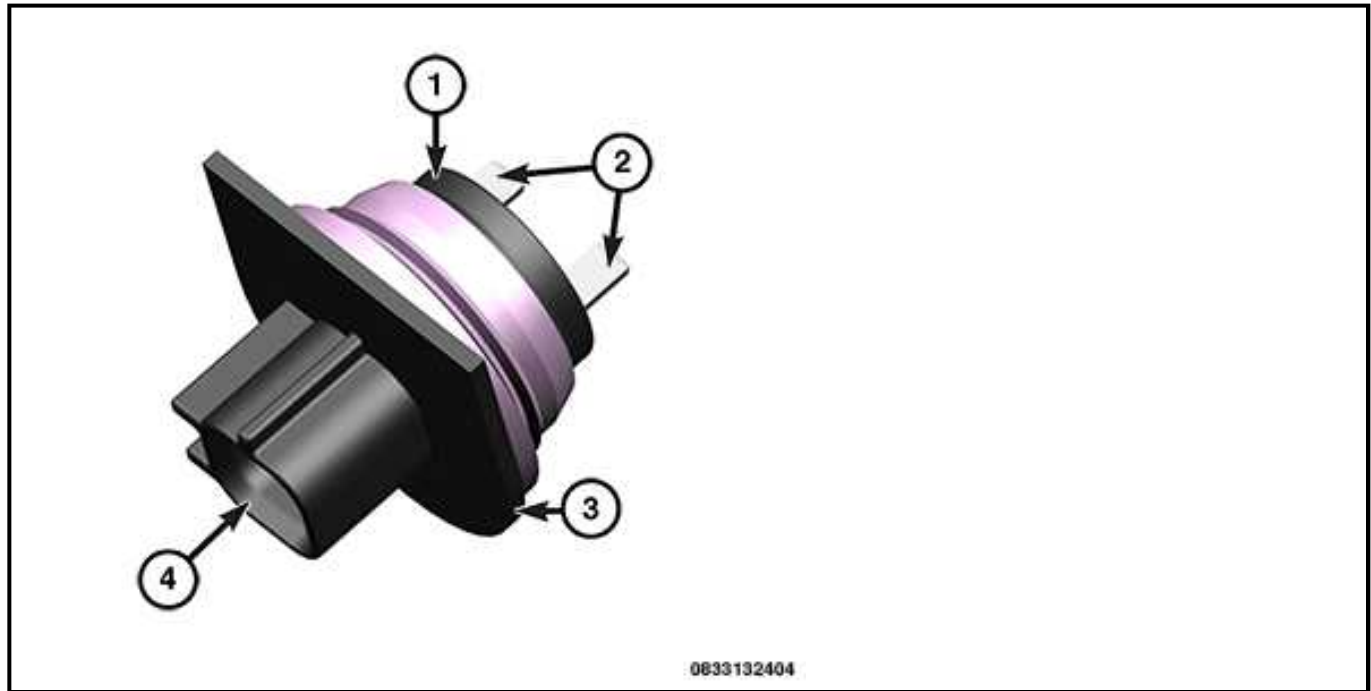
Washer fluid in the washer reservoir is pressurized and fed by the washer pump/motor unit through the washer system plumbing and fittings to the two windshield washer nozzles and FVC lens nozzle, if equipped.

Whenever routing the washer plumbing or a wire harness containing washer plumbing, it must be routed away from hot, sharp, or moving parts. Sharp bends that might pinch the plumbing must be avoided.

WASHER FLUID LEVEL SWITCH

WASHER FLUID LEVEL SWITCH

Refer to [COMPONENT INDEX](#).



The washer fluid level switch (3) is a two-pin conductivity switch with no moving parts mounted on the inboard facing side of the washer reservoir on the left frame rail, ahead of the left front wheel opening on all except 3.0L diesel equipped vehicles. On 3.0L diesel equipped vehicles, the washer fluid level switch is mounted on the outboard side of the washer reservoir. Only the molded plastic switch mounting flange and the integral connector receptacle (4) are visible when the switch is installed in the reservoir.

A short nipple formation (1) extends from the inner surface of the switch mounting flange, and a barb on the nipple is pressed through a rubber grommet seal installed in the mounting hole of the reservoir. Two over-molded stainless steel pins or electrodes (2) extend from the back of the nipple formation. The switch is connected to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness.

The washer fluid level switch uses fluid conductivity to monitor the level of the washer fluid in the washer reservoir. Electricity is conducted between the two switch pins or electrodes only when they are immersed in the washer fluid, which closes the switch circuit. When the fluid level in the washer reservoir falls below the pins, electrical current cannot be conducted and the switch becomes an open circuit, which signals a low fluid condition.

In order to prevent an electrical charge from accumulating in the electrical leads of the switch, the switch receives current that is pulsed from the BCM located in the passenger compartment. The BCM monitors the switch return signal and is programmed to respond to three consecutive open switch readings by sending an electronic **washer fluid indicator lamp-ON request** message to the Instrument Panel Cluster (IPC) over the CAN data bus. The IPC responds to this message by illuminating the washer fluid indicator and by sounding an audible chime tone warning.

The washer fluid level switch is connected to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness. The switch is connected in series between a sensor return circuit and the washer fluid switch sense input to the BCM.

The washer fluid level switch and the hardwired circuits between the switch and the BCM may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the washer fluid level indicator or the electronic controls and communication between other modules and devices that provide some features of the washer system. The most reliable, efficient and accurate means to diagnose the washer fluid level indicator or the electronic controls and communication related to washer fluid level switch operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

The washer fluid level switch cannot be adjusted or repaired. If ineffective or damaged, the switch must be replaced.

WASHER FLUID NOZZLES WITH INTEGRAL CHECK VALVES

WASHER FLUID NOZZLES WITH INTEGRAL CHECK VALVES

Refer to **[COMPONENT INDEX](#)**.

The two windshield washer nozzles are designed to dispense washer fluid into the wiper pattern area on the outside of the windshield glass. Pressurized washer fluid is fed to each nozzle from the washer reservoir by the washer pump/motor unit through a single hose, which is attached to a barbed nipple on each washer nozzle below the hood panel. A fluidic matrix within the washer nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

The integral check valve in each nozzle prevents washer fluid from draining out of the washer supply hoses back to the washer reservoir. This drain-back would result in a lengthy delay after the washer switch is actuated until washer fluid was dispensed through the nozzles, because the washer pump would have to refill the washer plumbing from the reservoir to the nozzles. Such a drain-back condition could also result in water, dirt, or other outside contaminants being siphoned into the washer system through the washer nozzle orifice. This water could subsequently freeze and plug the nozzle, while other contaminants could interfere with proper nozzle operation and cause improper nozzle spray patterns. In addition, the check valve prevents washer fluid from siphoning through the washer nozzles after the washer system is turned OFF.

When the washer pump pressurizes and pumps washer fluid from the reservoir through the washer plumbing, the fluid pressure unseats a diaphragm from over a sump well within the nozzle by overriding the spring pressure applied to it by a piston. With the diaphragm unseated, washer fluid is allowed to flow toward the nozzle orifice. When the washer pump stops operating, the spring pressure on the piston seats the diaphragm over the sump well in the nozzle and fluid flow in either direction within the washer plumbing is prevented.

WASHER FLUID RESERVOIR

WASHER FLUID RESERVOIR

Refer to **[COMPONENT INDEX](#)**.

The washer fluid reservoir provides a secure, on-vehicle storage location for a large reserve of washer fluid for operation of the windshield washer system. On all models except 3.0L diesel equipped models, the integral washer reservoir filler neck provides a clearly marked and readily accessible point from which to add washer fluid to the reservoir. On 3.0L diesel equipped models, the washer reservoir filler neck is separate from the reservoir.

The washer fluid pump is located in a sump area, near the bottom on the inboard side of the reservoir on LHD vehicles and the outboard side of the reservoir on RHD vehicles, to be certain that washer fluid will be available to the pump as the fluid level in the reservoir becomes depleted.

On all models except 3.0L diesel equipped models, the washer fluid reservoir is located in front of the left wheelhouse splash shield, on the inboard side of the left fender. It is easily identified by the integral washer fluid filler cap. On models equipped with a 3.0L diesel, the washer fluid reservoir, with separate washer fluid fill neck and cap, is located below the brake booster, behind the left wheelhouse splash shield.

WASHER FLUID RESERVOIR FILLER NECK AND CAP

WASHER FLUID RESERVOIR FILLER NECK AND CAP

Refer to [COMPONENT INDEX](#).

On models equipped with a 3.0L diesel engine, the washer fluid reservoir filler neck is separate from the washer fluid reservoir and can be service separately from the reservoir. On all other engine equipped models, the filler neck is integral to the washer fluid reservoir and is serviced only with the reservoir.

The washer reservoir filler neck provides a means for replenishing the washer fluid when it becomes low. The filler neck cap keeps dirt and debris out of the washer fluid reservoir. The reservoir cap is yellow mold-in color with the international symbol for windshield washer on it for high visibility and quick, easy identification.

WIPER ARMS AND BLADES

WIPER ARMS AND BLADES

Refer to [COMPONENT INDEX](#).

The wiper blades are moved back and forth across the glass by the wiper arms when the wipers are being operated. The wiper blade flexor is the flexible metal that is secured the length of the wiper blade element that evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the flexor makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature that may be encountered across the glass surface.

The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, yet resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions.

The wiper arms are designed to mechanically transmit the motion from the wiper pivots to the wiper blades. The wiper arm must be properly indexed to the wiper pivot in order to maintain the proper wiper blade travel on the glass. The tapered mounting hole in the wiper arm pivot end interlocks with the serrations on the tapered outer circumference of the wiper pivot shaft, allowing positive engagement and finite adjustment of this connection.

The mounting nut locks the wiper arm to the threaded stud of the wiper pivot shaft. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The receptacle on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

WIPER MOTOR AND LINKAGE

WIPER MOTOR AND LINKAGE

Refer to [COMPONENT INDEX](#).

The wiper linkage module operation is controlled by the battery current inputs received by the wiper motor through the BCM. The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. An automatic resetting circuit breaker protects the motor from overloads.

The park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes the wiper park switch sense circuit to ground or to battery current, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned OFF, and to park the wiper blades in the lowest portion of the wipe pattern.

The wiper motor crank arm, the two wiper linkage members and the two wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass.

The hardwired inputs and outputs of the wiper system may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will

not prove conclusive in the diagnosis of the electronic controls and communication between other modules and devices that provide some features of the wiper and washer system. The most reliable, efficient and accurate means to diagnose the wiper system or the electronic controls and communication related to wiper system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - WIPER AND WASHER SYSTEM

WARNING: To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

If the wiper motor operates but the wiper blades do not move on the windshield, verify that the arms are properly tightened to the pivot shaft(s). If the problem continues, replace the ineffective wiper motor or wiper linkage module. If the washer pump operates but no washer fluid is dispensed on the glass, verify the nozzles are not blocked and the hoses are not pinched or kinked. If the problem continues, replace the washer pump. If the wipers operate but chatter, lift, or do not clear the glass, clean and inspect the wiper arms and blades for physical damage and replace damaged part(s). and. Refer to [CLEANING](#). Refer to [INSPECTION](#).

The hardwired wiper and washer system circuits and components may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to [STANDARD PROCEDURE](#) . and. Refer to [REMOVAL](#) . Refer to [INSTALLATION](#) .

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the wiper and washer system or the electronic controls and communication between other modules and devices that provide some features of the wiper and washer system. The most reliable, efficient and accurate means to diagnose the wiper and washer system or the electronic controls and communication related to wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

FRONT WIPER AND WASHER SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER MOTOR DOES NOT OPERATE IN ANY SWITCH POSITION	1. Ineffective motor ground circuit.	1. Test and repair open wiper motor ground circuit if required.
	2. Ineffective motor feed circuits.	2. Test and repair low speed and high speed feed circuits between Body Control Module (BCM) and wiper motor as required.
	3. Ineffective right multifunction switch.	3. Test and replace the Steering Column Control Module (SCCM), if required.
	4. Ineffective BCM inputs or outputs.	4. Use a diagnostic scan tool for additional testing of the BCM. Refer to the appropriate diagnostic information.
	5. Ineffective wiper motor.	5. Test and replace open or shorted wiper motor as required.
WIPER MOTOR OPERATES SLOWLY IN ALL SWITCH POSITIONS	1. Ineffective wiper motor.	1. Check amperage draw with linkage disconnected from wiper motor output shaft. Correct draw should be about 6 amperes. If

FRONT WIPER AND WASHER SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
		incorrect, refer to the appropriate Possible Cause that follows.
	2. Amperage draw too low.	2. Test and repair shorted low and high speed feed circuits, if required.
	3. Amperage draw too high.	3. With linkage disconnected from wiper motor output shaft, check linkage and pivots for binding. If binding is detected, repair or replace wiper linkage module, if required. If no linkage binding detected, replace the wiper motor, if required.
WIPERS RUN AT HIGH SPEED WITH SWITCH LOW SPEED SELECTED OR AT LOW SPEED WITH SWITCH HIGH SPEED SELECTED	1. Ineffective motor feed circuit wiring.	1. Test and repair low speed and high speed feed circuits between BCM and the wiper motor, if required.
WASHER PUMP DOES NOT OPERATE	1. Ineffective washer pump ground circuit.	1. Test and repair open washer pump ground circuit, if required.
	2. Ineffective washer pump feed circuit.	2. Test and repair washer pump feed circuits between BCM and washer pump, if required.
	3. Ineffective right multifunction switch.	3. Test and replace the SCCM, if required.
	4. Ineffective BCM inputs or outputs.	4. Use a diagnostic scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
	5. Ineffective washer pump.	5. Test and replace open or shorted washer pump, if required.

TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	COMMENT
Front Wiper Arm Mounting Nut	23	17	-	B
Front Wiper linkage Mounting bolts	8	-	71	B
Windshield Washer Reservoir Upper Bolt	4	-	35	B
Windshield Washer Reservoir Bracket Bolts	11	8	-	B
Windshield Washer Reservoir Bracket Lower Bolt	3	-	26	B

CLEANING

FRONT WASHER SYSTEM

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and

hoses of the washer system, as well as the rubber squeegees of the wiper blades.

CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the washer pump/motor unit from the reservoir. Clean foreign material from the inside of the washer pump inlet filter screen and the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hoses from the washer nozzles, then running the washer pump/motor to run clean washer fluid or water through the system. If a washer nozzle obstruction cannot be cleared, replace the washer nozzle.

FRONT WIPER SYSTEM

CAUTION: Protect the rubber squeegees of the wiper blades from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegees.

NOTE: Wiper blade assembly replacement will NOT resolve hazing or beading.

The squeegees of wiper blades exposed to the elements for a long time tend to lose their wiping effectiveness. Periodic cleaning of the squeegees and the windshield glass is suggested to remove any deposits of salt, wax or road film. The wiper blades, arms and windshield glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent or a non-abrasive cleaner. If the wiper blades continue to leave streaks, smears, hazing or beading on the glass after cleaning of the squeegees and the glass, clean them again.

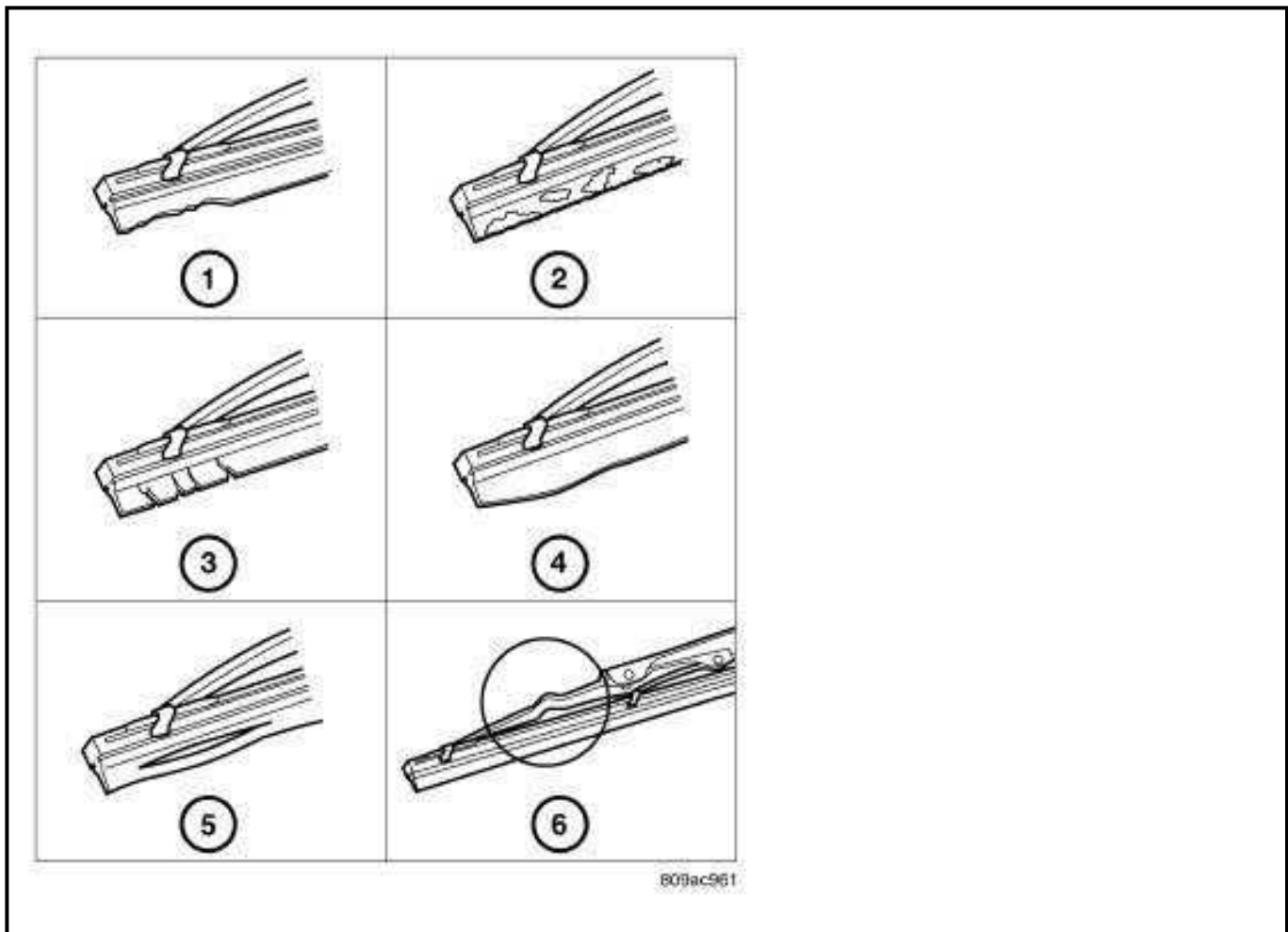
INSPECTION

FRONT WASHER SYSTEM

The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

1. Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. Refer to **CLEANING**.
2. Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

FRONT WIPER SYSTEM



The wiper blades and wiper arms should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

1. Carefully inspect the wiper blades for any indications of worn or uneven edges (1), foreign material deposits (2), hardening or cracking (3), deformation or fatigue (4) or splitting (5). Inspect the wiper blade support components and the wiper arms for damage (6) or severe corrosion. If the wiper arms and blades are contaminated with any foreign material, clean them and the glass as required. Refer to **CLEANING**. If a wiper blade or arm is damaged, or if severe corrosion is evident, replace the affected wiper arm or blade with a new unit. Do not attempt to repair a wiper arm or blade that is damaged or severely corroded.
2. Carefully lift the wiper blade from the glass. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or if there is evident lateral play in the wiper arm hinge, replace the wiper arm.

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

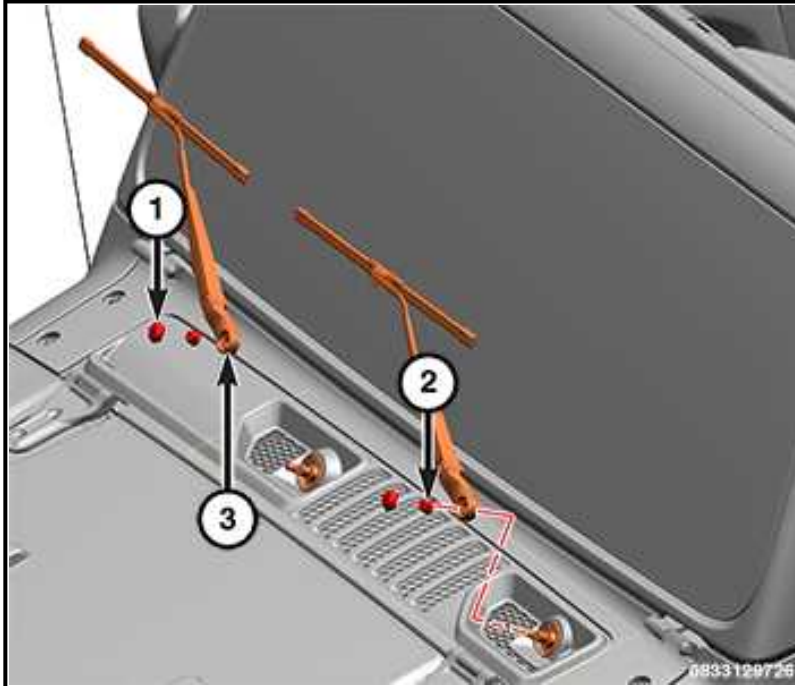
3. Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. The spring tension of the wiper arm should be sufficient to cause the rubber squeegee to conform to the curvature of the glass. Replace a wiper arm if it has insufficient spring tension to maintain contact between the squeegee and the glass.
4. After cleaning and inspecting the wiper components and the glass, if the wiper blade still fails to clear the glass without smearing, streaking or chattering, replace the wiper blade.

ARM, WIPER

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL



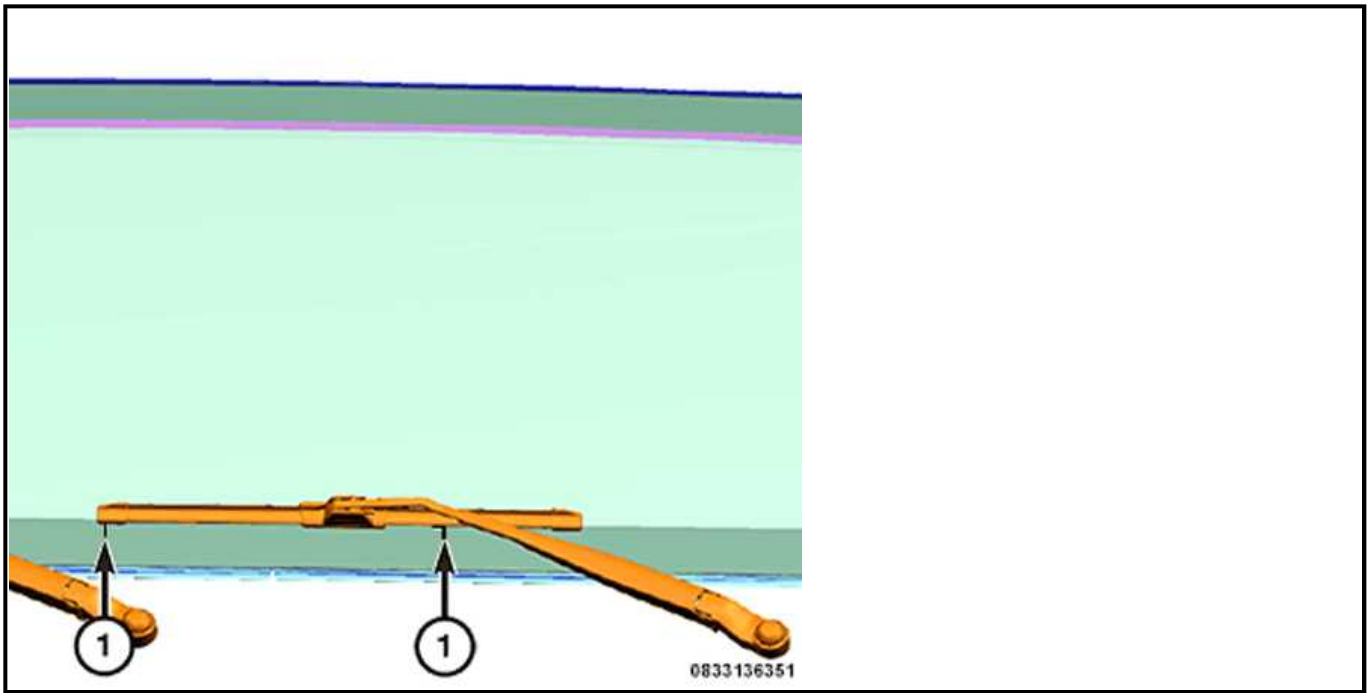
1. Lift the wiper arm (3) to its over-center position to hold the wiper blade from the glass and relieve the spring tension on the wiper arm to pivot shaft connection.
2. Carefully unsnap the plastic cap (1) from the wiper arm.
3. Remove the nut (2) that secures the wiper arm to the wiper pivot shaft.

CAUTION: The use of a battery terminal puller when removing the front wiper arm is **NOT** recommended as this may damage the front wiper arm.

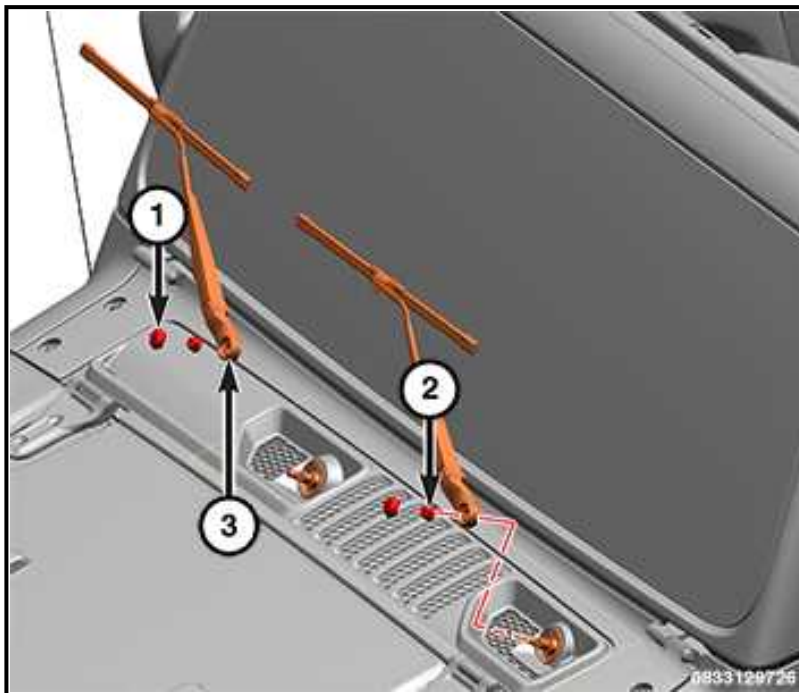
4. Use a slight rocking action to disengage the wiper arm pivot end from the pivot shaft and remove the wiper arm.

INSTALLATION

NOTE: Be certain that the wiper motor is in the park position before attempting to install the wiper arms. Turn the ignition switch to the ON position and move the right (wiper) multifunction switch control knob to its OFF position. If the wiper pivots move, wait until they stop moving, then turn the ignition switch back to the OFF position. The wiper motor is now in its park position.



1. The wiper arms must be indexed to the pivot shafts with the wiper motor in the park position to be properly installed. Loosely position the wiper arm pivot end to the wiper pivot shaft so that the wiper blade is aligned with the wiper alignment line, which is a horizontal T mark (1) located just above the upper margin of the lower windshield.



2. Once the wiper blade is aligned, lift the wiper arm (3) away from the windshield slightly to relieve the spring tension on the pivot end and push the pivot end of the wiper arm down firmly and evenly over the pivot shaft.
3. Install the nut (2) that secures the wiper arm to the pivot shaft and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
4. Snap the plastic cap (1) on the wiper arm pivot end.

BLADE, WIPER

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

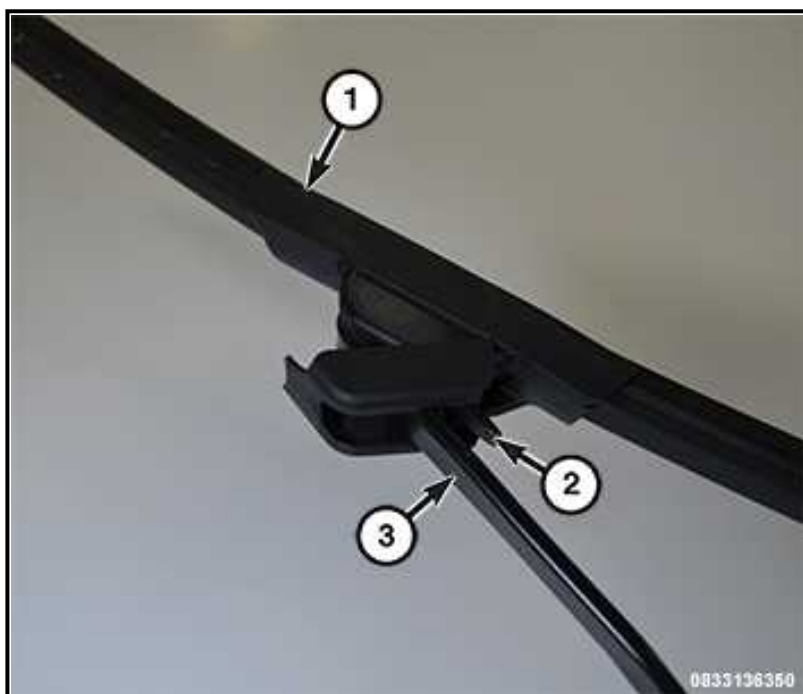
REMOVAL

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

1. Lift the wiper arm to raise the wiper blade and element until the wiper arm hinge is in its over-center position.

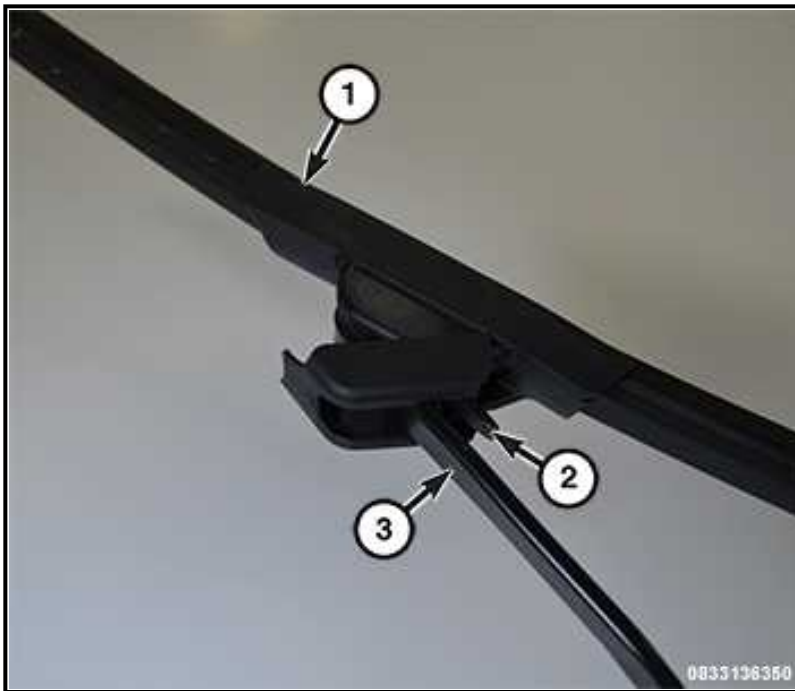


2. Open the wiper blade protective cap (1).



3. Press the lock tab (2) and slide wiper blade (1) downward releasing it from the hook end of the wiper arm (3).

INSTALLATION



1. Position the wiper blade (1) under the hook end of the wiper arm (3) and slide the wiper blade (1) forward to engage the lock tab (2) with an audible click.



2. Close the protective cap (1) on the wiper blade.
3. Gently lower the wiper blade and element to the glass.

LINKAGE, WIPER ARM

REMOVAL AND INSTALLATION

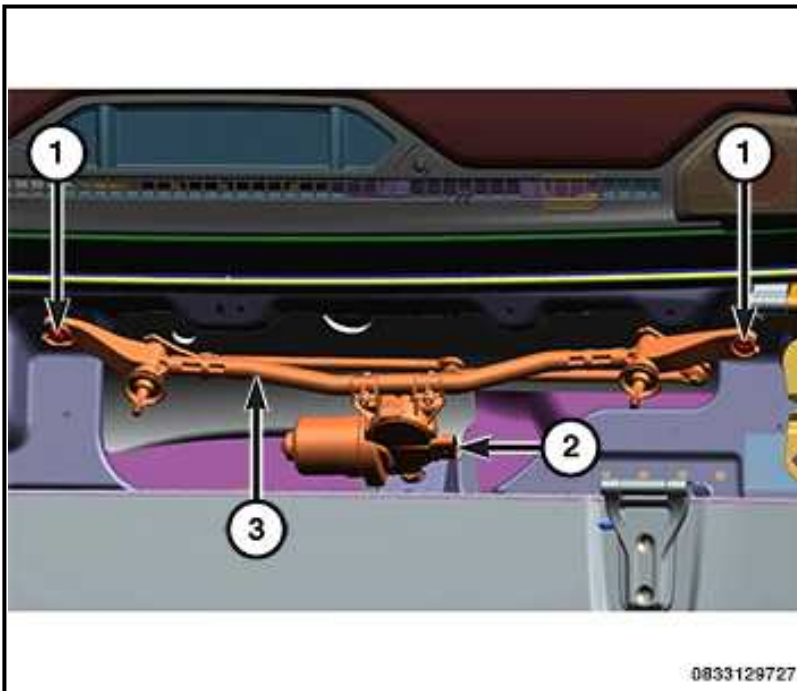
REMOVAL AND INSTALLATION

REMOVAL

NOTE: The wiper linkage module includes the wiper motor.

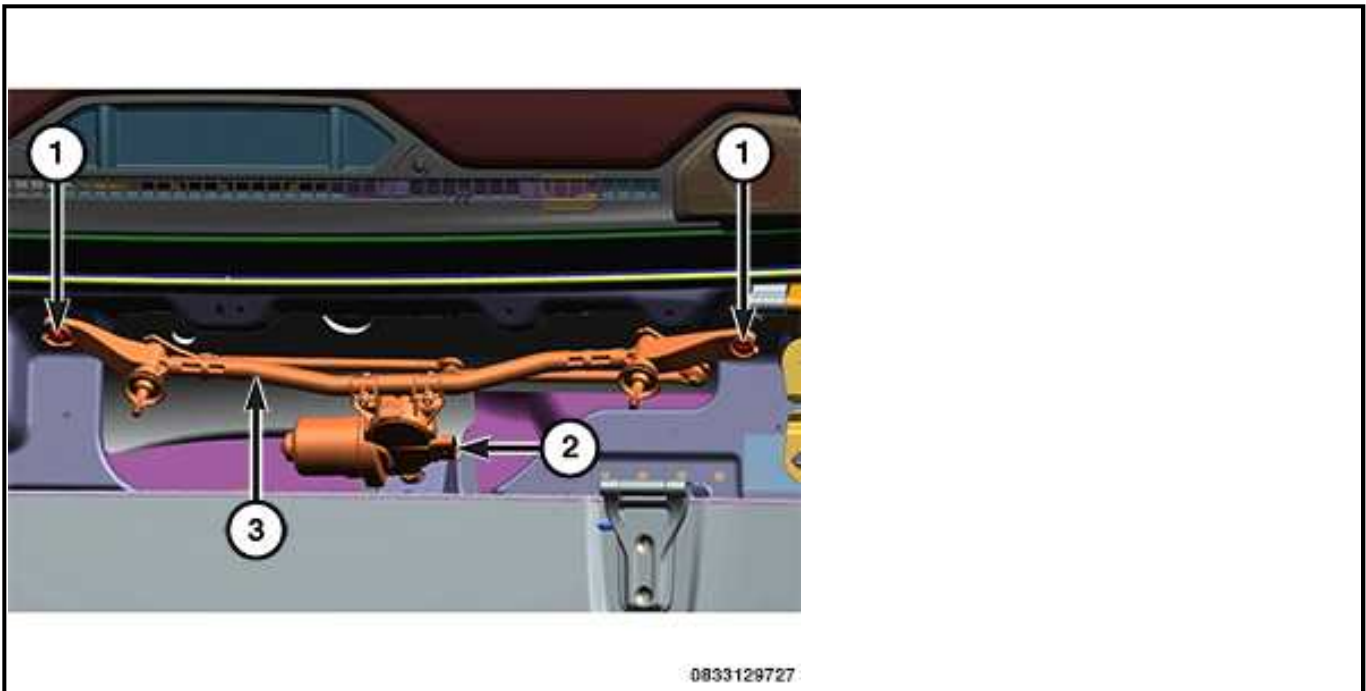
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .

2. Remove both wiper arms from the wiper pivots. Refer to [ARM, WIPER, REMOVAL AND INSTALLATION](#).
3. Remove the cowl plenum cover/grille panel from over the wiper linkage module. Refer to [COVER, COWL PANEL, REMOVAL AND INSTALLATION](#).



4. Disconnect the wire harness connector (2) from the connector receptacle for the wiper motor.
5. Remove the two bolts (1) that secure the module (3) to the cowl plenum.
6. Remove the wiper linkage module from the cowl plenum as a unit.

INSTALLATION



1. Position the wiper linkage module (3) into the cowl plenum as a unit.
2. Install the two wiper linkage module bolts (1) and tighten to the proper. Refer to [TORQUE SPECIFICATIONS](#).
3. Connect the wire harness connector (2) to the connector receptacle for the wiper motor.

4. Install the cowl plenum cover/grille panel. Refer to [COVER, COWL PANEL, REMOVAL AND INSTALLATION](#) .

5. Connect the negative battery cable(s). Refer to the appropriate service information .

NOTE: Be certain to transition the ignition to the ON status, then turn the wiper switch ON and OFF again to cycle the wiper motor and linkage to their natural park position before installing the wiper arms to the wiper pivots.

6. Install both wiper arms to the wiper pivots. Refer to [ARM, WIPER, REMOVAL AND INSTALLATION](#).

MOTOR, WIPER

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The wiper motor is packaged and serviced only as a unit with the wiper linkage module in this vehicle. Refer to [LINKAGE, WIPER ARM, REMOVAL AND INSTALLATION](#).

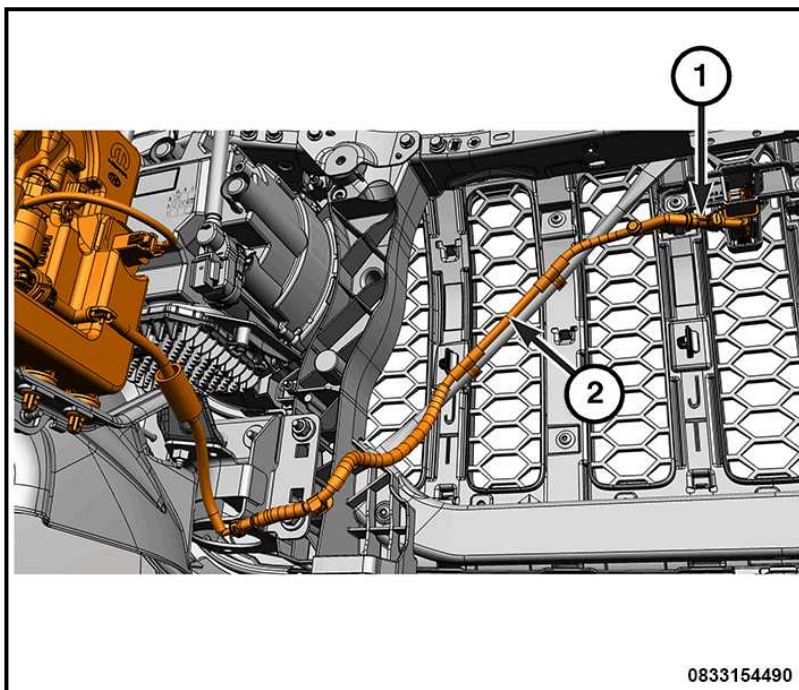
NOZZLE, WASHER

REMOVAL AND INSTALLATION

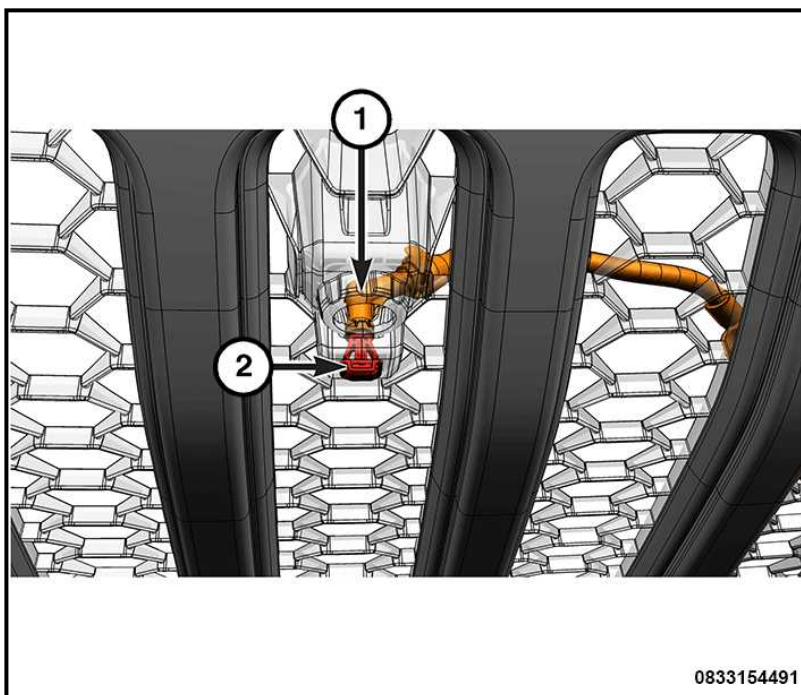
FRONT VIEW CAMERA WASHER NOZZLE

REMOVAL

1. Remove the grill. Refer to [GRILLE, REMOVAL AND INSTALLATION](#) .



2. Remove the front view camera washer hose (2) from the washer nozzle (1).



3. Release the two integral latch features of the washer nozzle (2) remove the washer nozzle through the front of the front view camera housing (1).

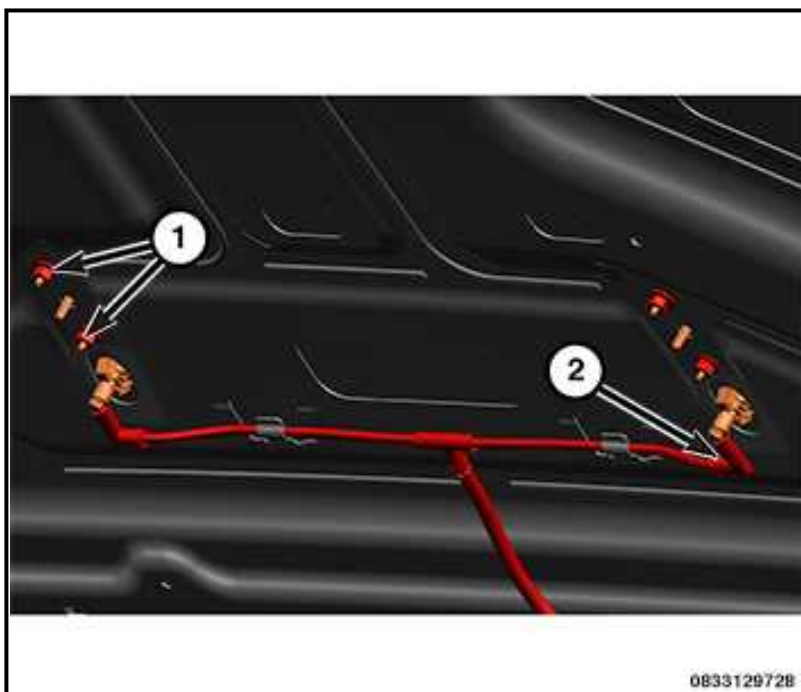
INSTALLATION

1. Position the front view camera washer nozzle in the front view camera housing and making sure the camera locking tabs seat.
2. Install the front view camera washer hose to the front view camera washer nozzle.
3. Install the grill. Refer to [GRILLE, REMOVAL AND INSTALLATION](#) .

WINDSHIELD WASHER NOZZLE

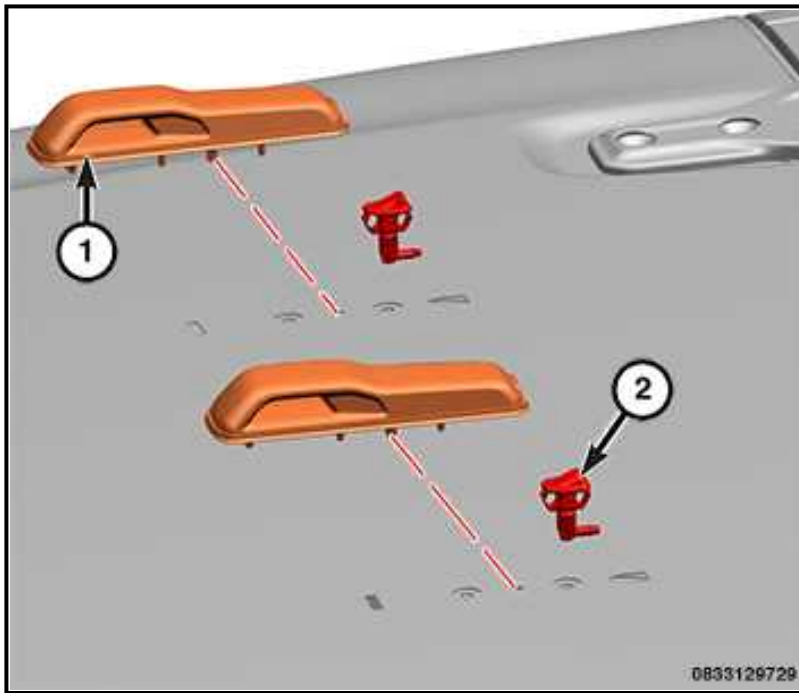
REMOVAL

1. Remove the hood insulation from the inner hood panel reinforcement.



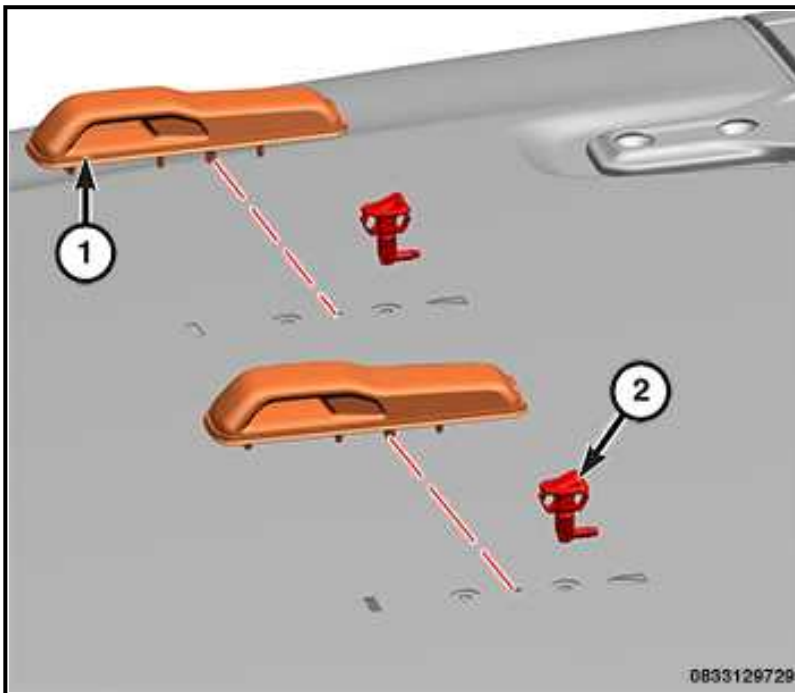
2. From the underside of the hood inner panel reinforcement remove the retaining nuts (1) from footman loop assembly.

3. Disconnect the windshield washer fluid supply hose (2) from the nipple of the washer nozzle.

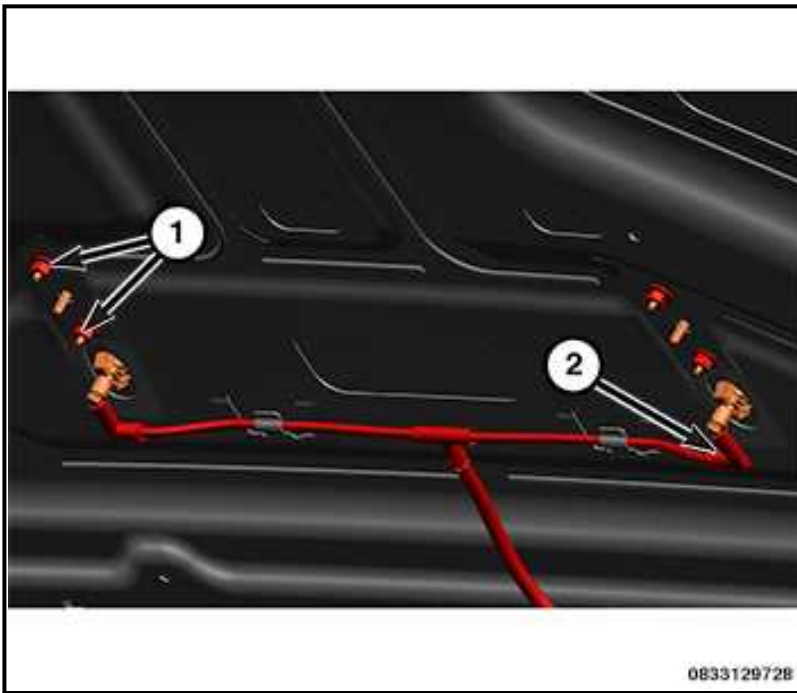


4. Remove the footman loop assembly (1) toward the outside of the hood panel.
5. Release the two integral latch features of the washer nozzle (2) and push the nozzle out through the mounting hole toward the outside of the hood panel.

INSTALLATION



1. Position the washer nozzle (2) into the mounting hole from the outside of the hood panel.
2. Using hand pressure, push firmly and evenly on the top of the nozzle until the two integral latches snap into place on the inside surface of the hood panel.
3. Position the footman loop assembly (1) into the mounting holes from the outside of the hood.



4. Install the footman loop assembly retaining nuts (1) and securely tighten.
5. Connect the supply hose (2) to the washer nozzle nipple.
6. Verify the proper function of the washer nozzles.
7. Install the hood insulation to the inner hood panel reinforcement.

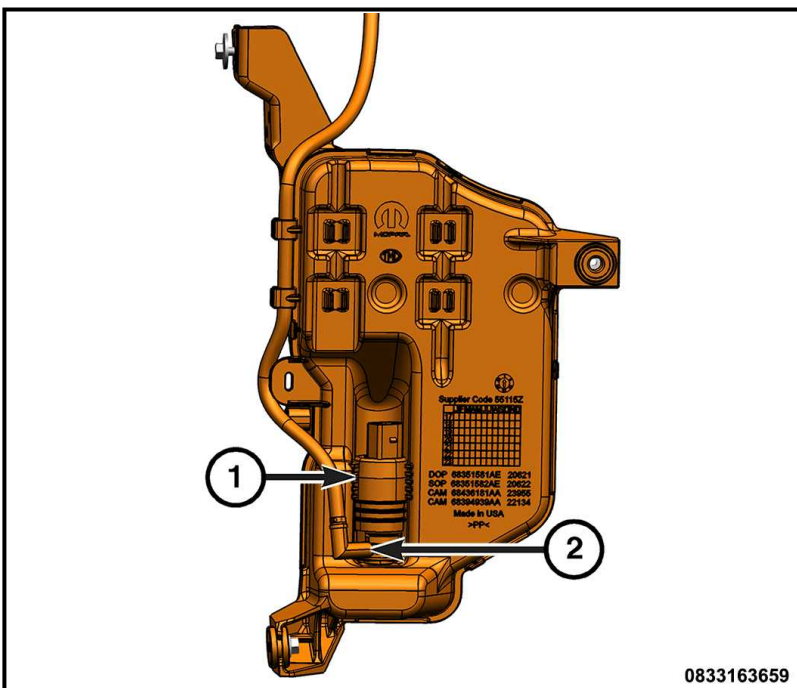
PUMP, WINDSHIELD WASHER

REMOVAL AND INSTALLATION

3.0L

REMOVAL

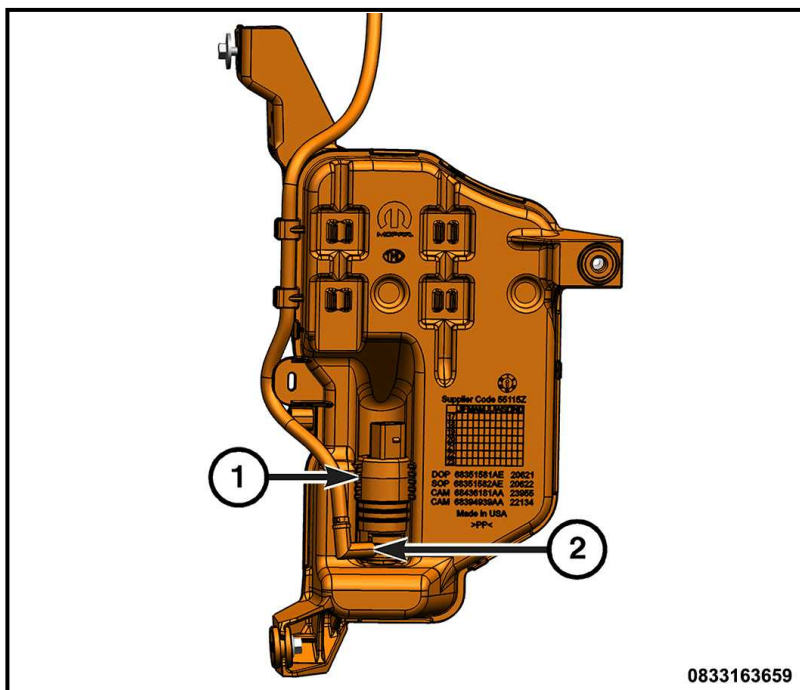
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the washer reservoir. Refer to [RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION](#).



3. If equipped with a rear washer, there will be a T-fitting on the washer pump. Note the location of the front and rear hoses.
4. Remove the washer hose(s) (2) from the washer pump (1).
5. Disconnect the washer pump wire harness connector.
6. Using hand pressure, firmly grasp and pull the washer pump (1) upward far enough to disengage the pump inlet nipple from the rubber grommet seal/filter screen in the washer reservoir. Care must be taken not to damage the reservoir.
7. Remove the washer pump (1) from the washer reservoir.
8. Remove the rubber grommet seal from the washer pump mounting hole in the reservoir and **DISCARD**.

INSTALLATION

1. Lubricate a **NEW** rubber grommet seal/filter screen with clean washer fluid and install it into the washer pump mounting hole in the washer reservoir. Always use a **NEW** rubber grommet seal/filter screen on the reservoir.



2. Position the inlet nipple on the base of the washer pump (1) unit to the rubber grommet seal/filter screen in the washer reservoir.
3. Using hand pressure, press firmly and evenly downward on the top of the washer pump unit (1) until the inlet nipple is fully seated in the rubber grommet seal/filter screen in the pump mounting hole of the reservoir.

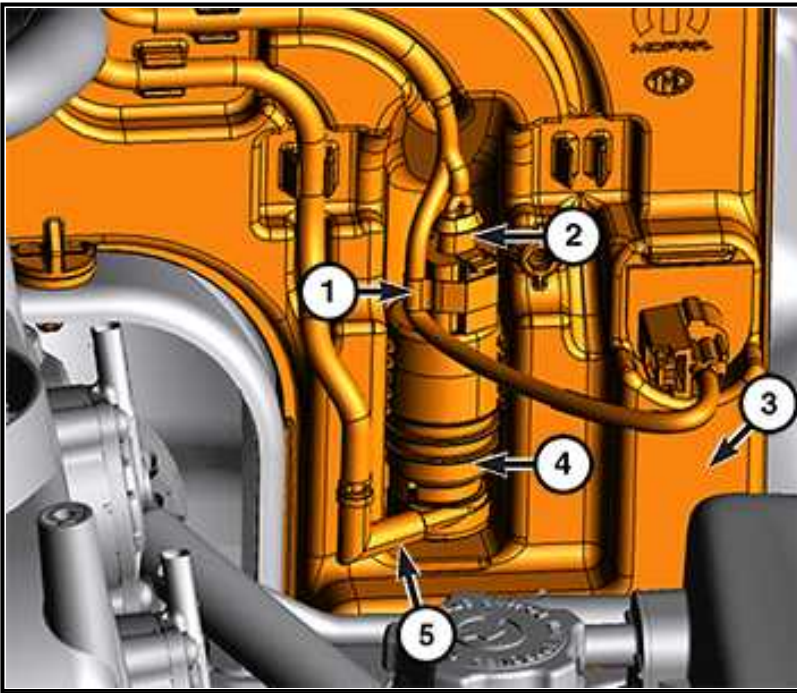
NOTE: If equipped, be certain to connect the front and rear washer hoses to the proper outlet T-fitting. Failure to properly connect the hoses will cause the front and rear washer systems to operate incorrectly.

4. Connect the washer hose(s) (2) to the washer pump (1).
5. Connect the washer pump wire harness connector.
6. Install the washer reservoir. Refer to [RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION](#).
7. Connect the negative battery cable(s). Refer to the appropriate service information.

3.6L

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the Powertrain Control Module (PCM). Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .



3. Disconnect the washer fluid level switch wire harness (1) from the washer pump wire harness connector (2).
4. Disconnect the washer pump wire harness connector (2).

NOTE: If equipped with the off road camera, there will be a T-fitting on the washer pump. Note the location of the hoses.

5. Remove the washer pump hose(s) (5) from the washer pump (4) and allow the washer fluid to drain into a clean container for reuse.
6. Using hand pressure, firmly grasp and pull the washer pump (4) upward far enough to disengage the pump inlet nipple from the rubber grommet seal/filter screen in the washer reservoir (3). Care must be taken not to damage the reservoir.
7. Remove the washer pump (4) from the washer reservoir (3).
8. Remove the rubber grommet seal from the washer pump mounting hole in the reservoir and **DISCARD** .

INSTALLATION

1. Lubricate a **NEW** rubber grommet seal/filter screen with clean washer fluid and install it into the washer pump mounting hole in the washer reservoir. Always use a **NEW** rubber grommet seal/filter screen on the reservoir.
2. Position the inlet nipple on the base of the washer pump unit to the rubber grommet seal/filter screen in the washer reservoir.
3. Using hand pressure, press firmly and evenly downward on the top of the washer pump unit until the inlet nipple is fully seated in the rubber grommet seal/filter screen in the pump mounting hole of the reservoir.

NOTE: If equipped, be certain to connect the camera and windshield washer hoses to the proper outlet T-fitting, Failure to properly connect the hoses will cause the washer systems to operate incorrectly.

4. Connect the washer hose(s) to the washer pump.

5. Connect the washer pump wire harness connector.
6. Connect the washer fluid level switch harness to the washer pump wire harness connector.
7. Install the Powertrain Control Module (PCM). Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
8. Connect the negative battery cable(s). Refer to the appropriate service information .

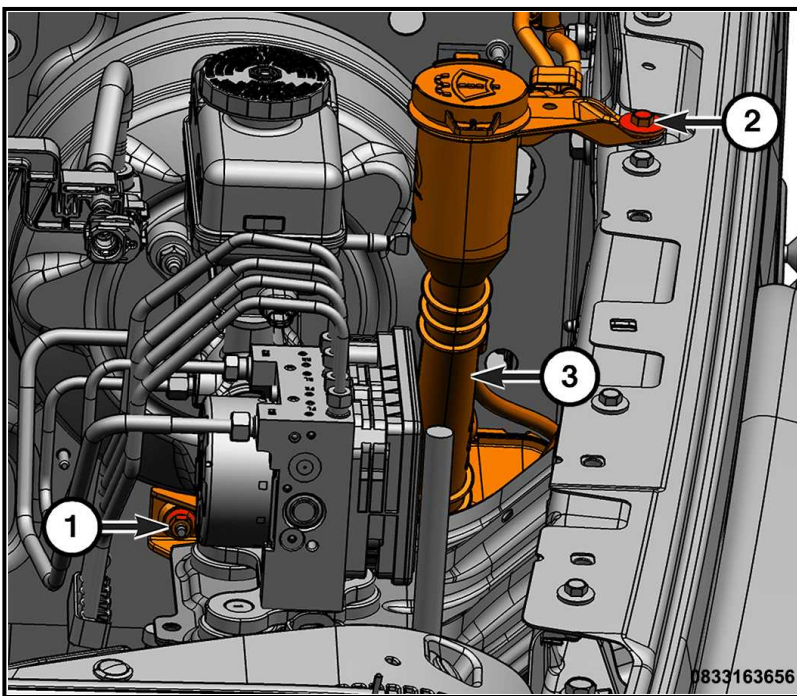
RESERVOIR, WINDSHIELD WASHER

REMOVAL AND INSTALLATION

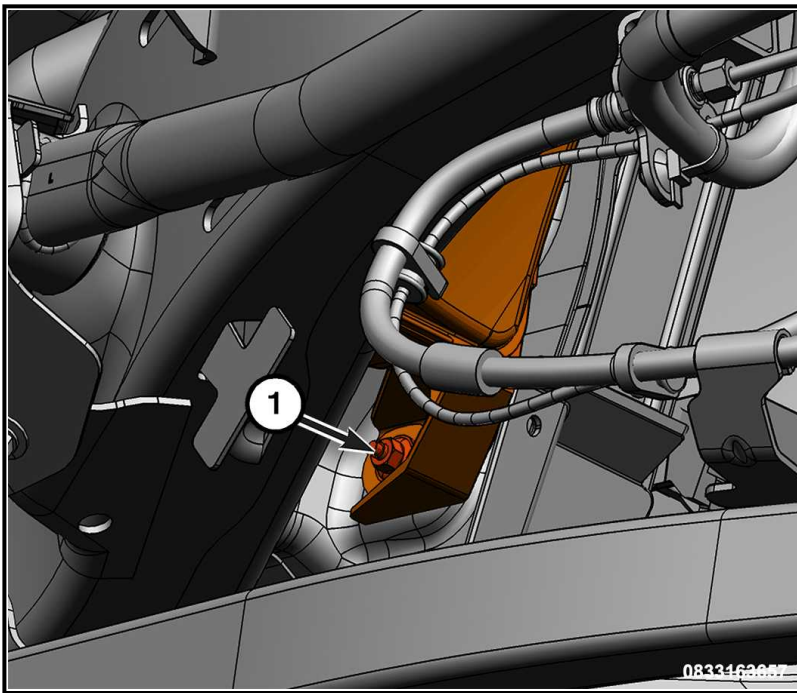
3.0L

REMOVAL

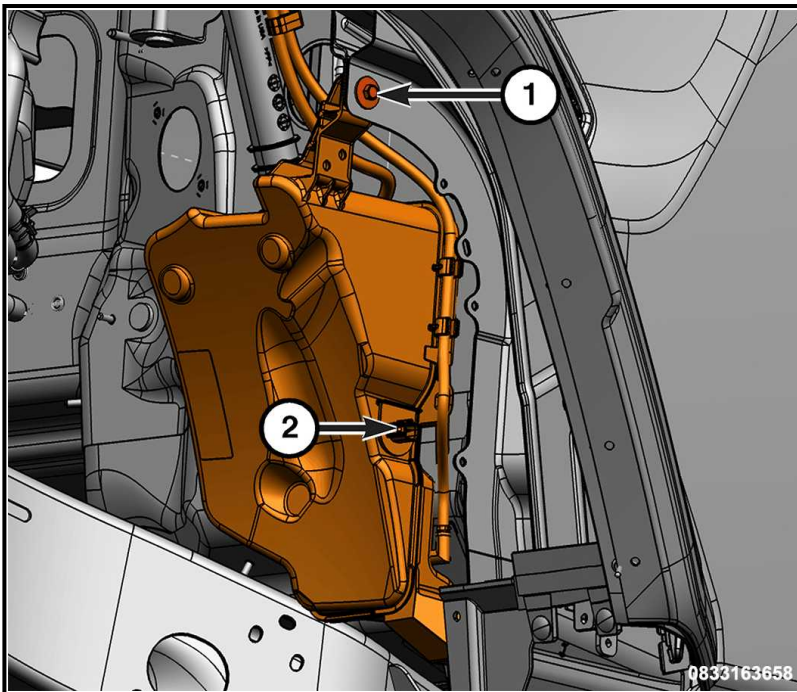
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the front wheel and splash shield. Refer to [SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION](#) .



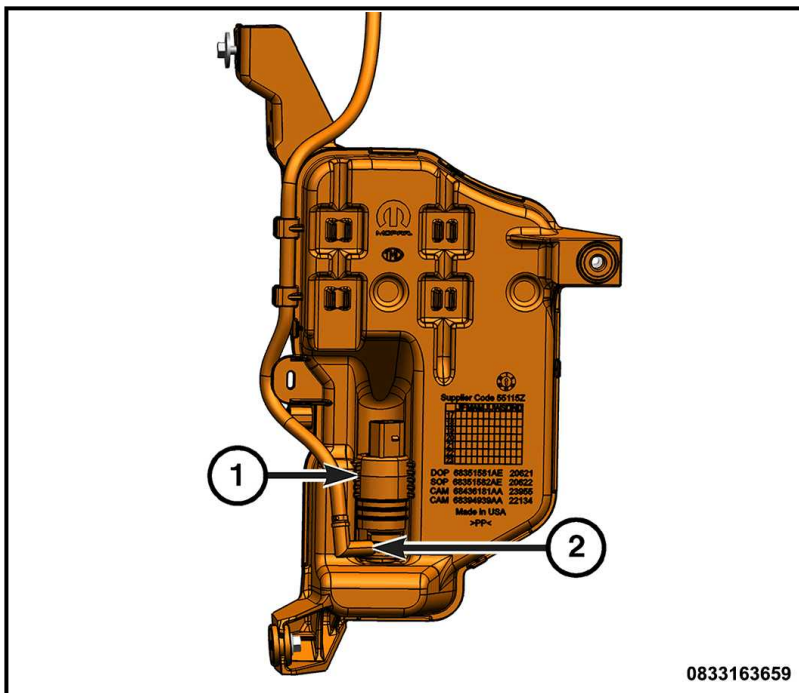
3. Remove the upper fastener (2) and remove the washer filler neck (3).
4. Remove the lower washer bottle fastener (1) through the wheel opening.



5. Remove the lower washer bottle fastener (1).

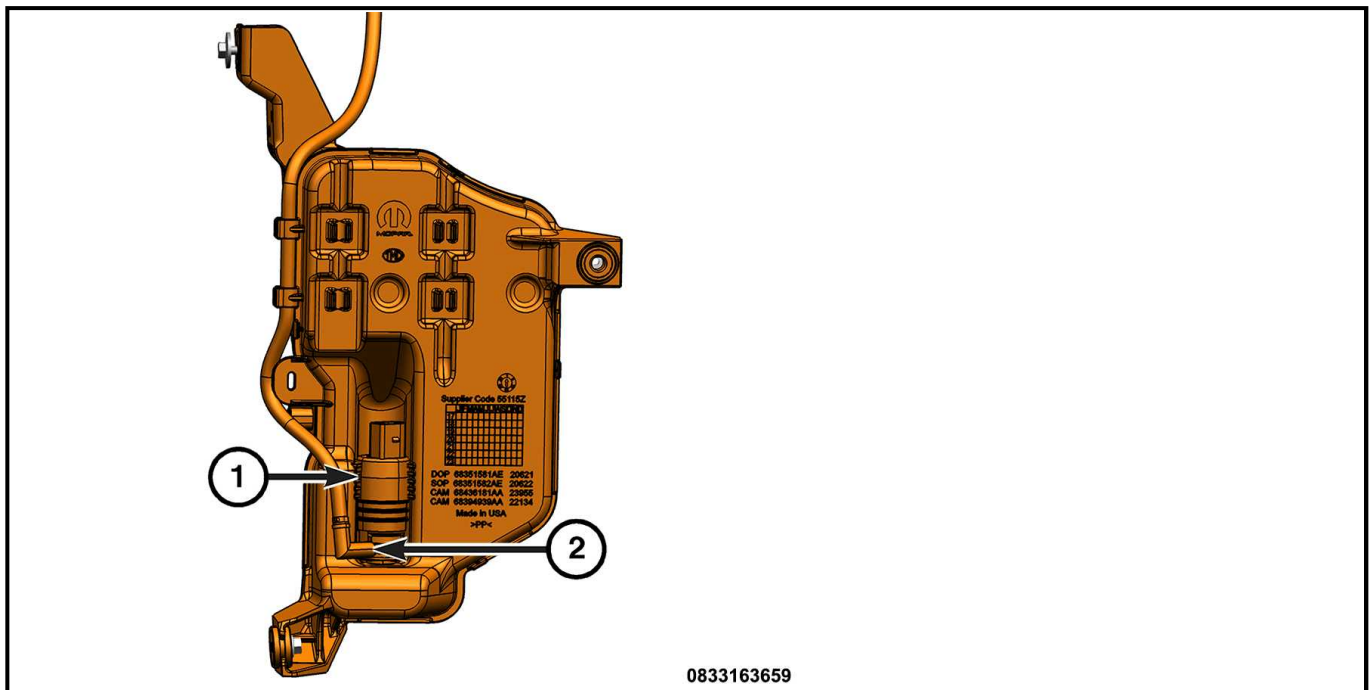


6. Disconnect the washer fluid level switch (2) wire harness connector and remove the fastener (1) for the washer bottle.

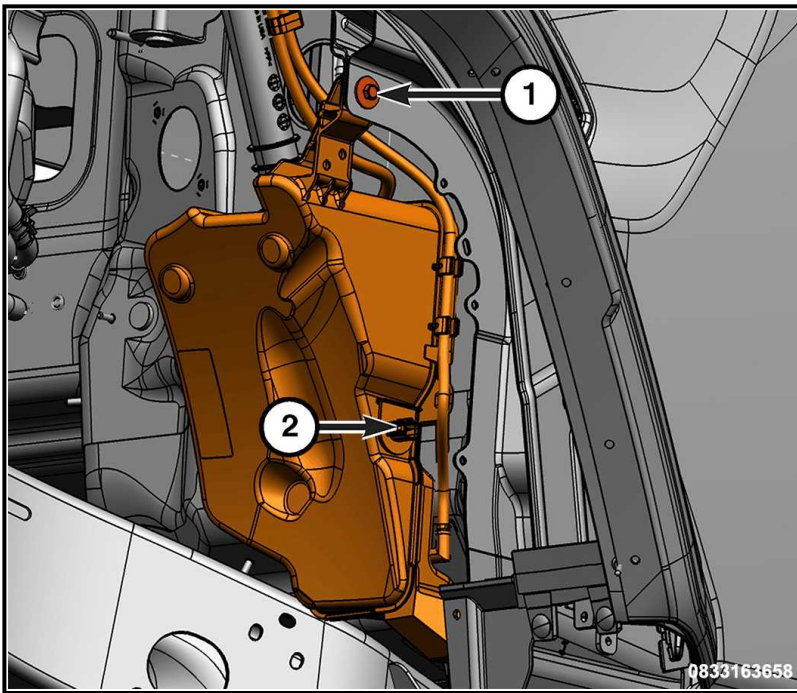


7. Disconnect the washer pump (1) wire harness connector and the washer hose (2).
8. Remove the washer reservoir from the vehicle.

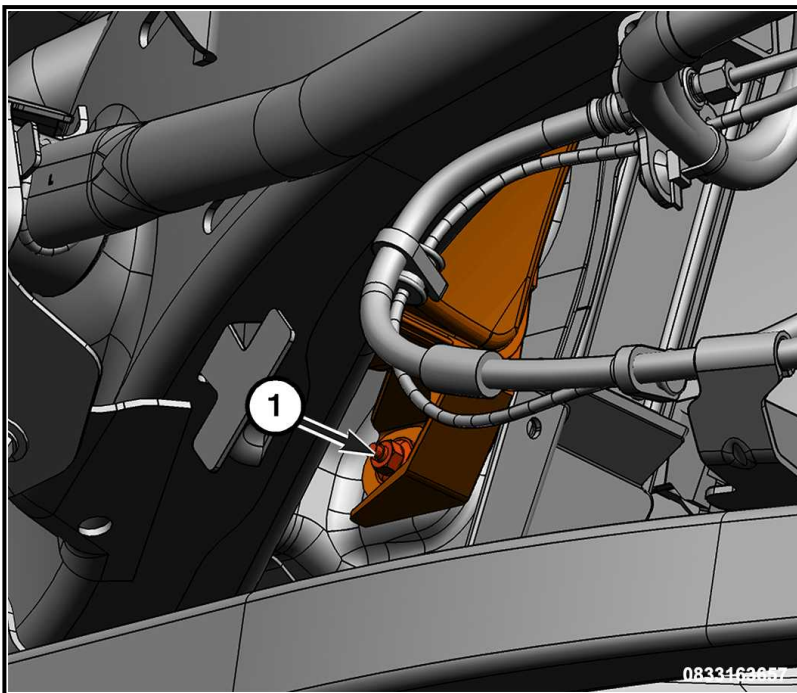
INSTALLATION



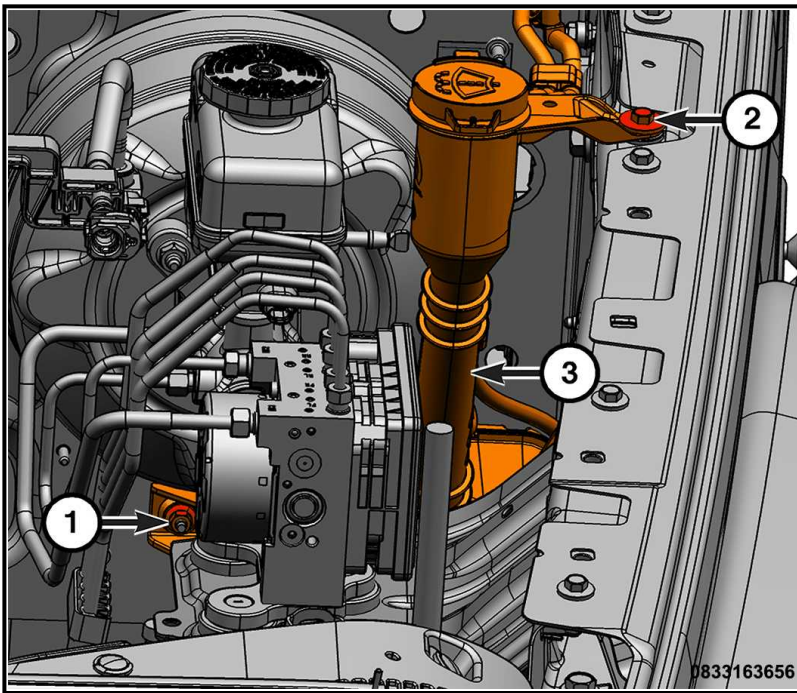
1. Connect the washer hose (2) to the washer pump and the washer pump (1) wire harness connector.



2. Position the washer bottle to the vehicle.
3. Install the washer bottle fastener (1) and tighten securely.
4. Connect the washer fluid level switch wire harness connector.



5. Install the lower washer reservoir fastener and tighten securely.

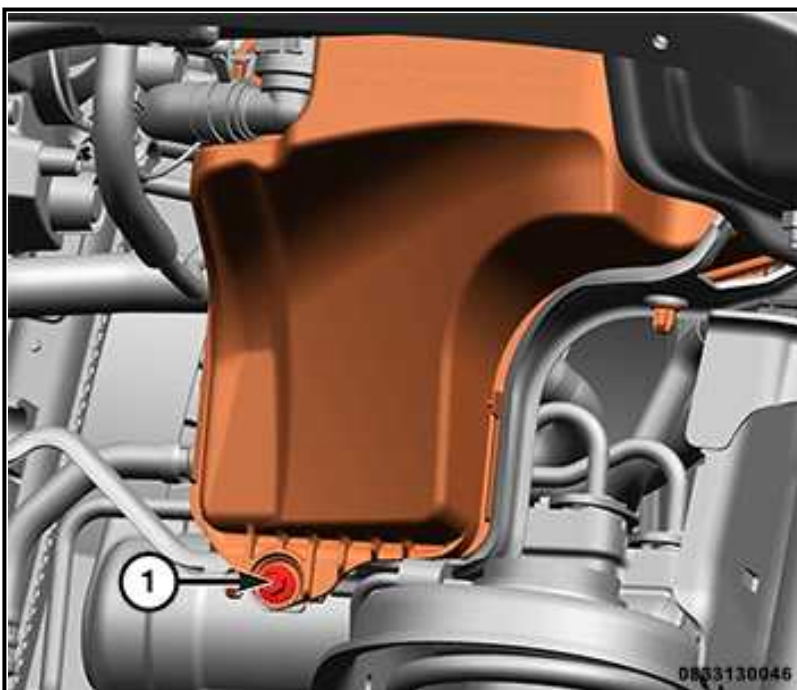


6. Install the washer bottle inside fastener (1) and tighten securely.
7. Install the washer filler neck (3) and install the upper fastener (2).
8. Tighten the upper fastener (2) securely.
9. Install the front splash shield and the front wheel. Refer to [**SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION**](#) .
10. Connect the negative battery cable(s). Refer to the appropriate service information .

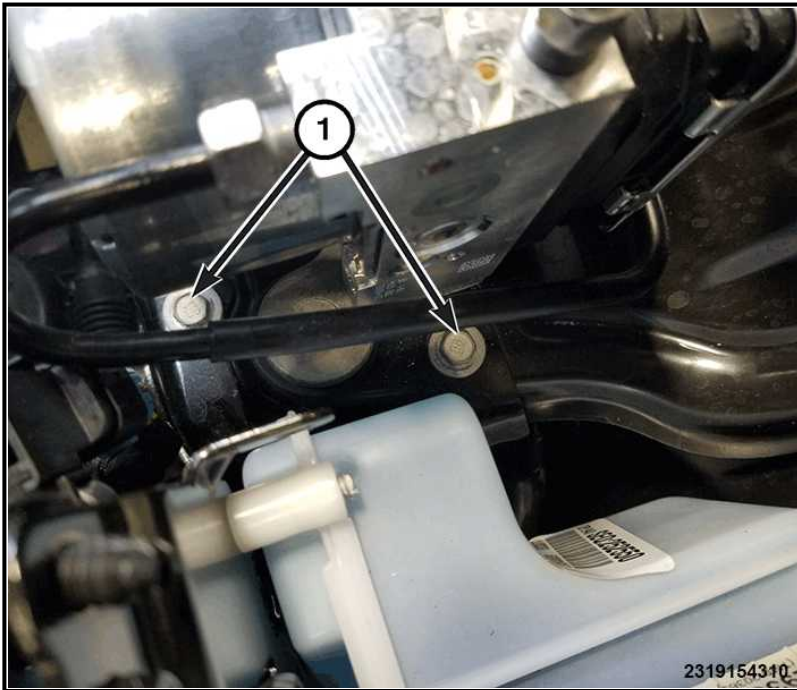
3.6L

REMOVAL

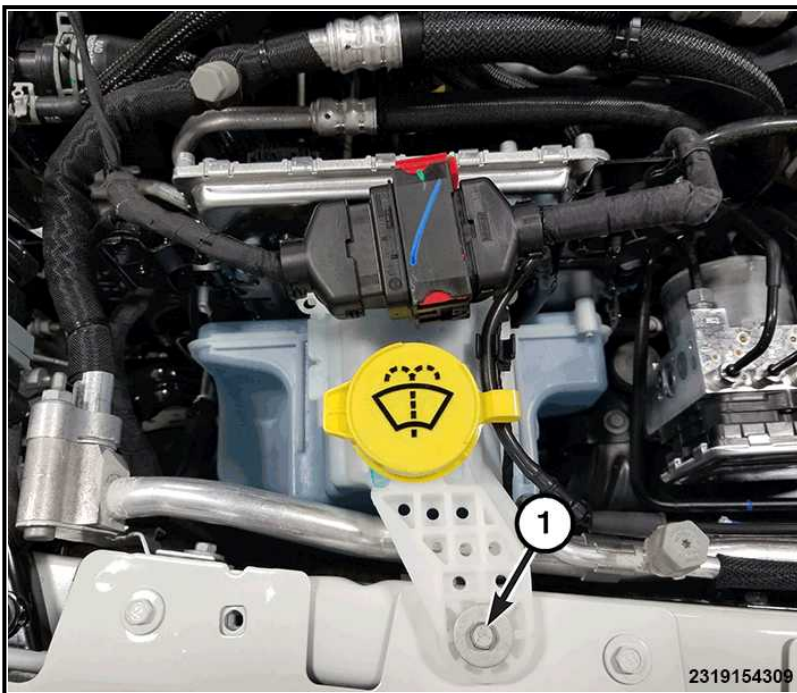
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the Powertrain Control Module (PCM). Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
3. Remove the left front splash shield. Refer to [**SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION**](#) .



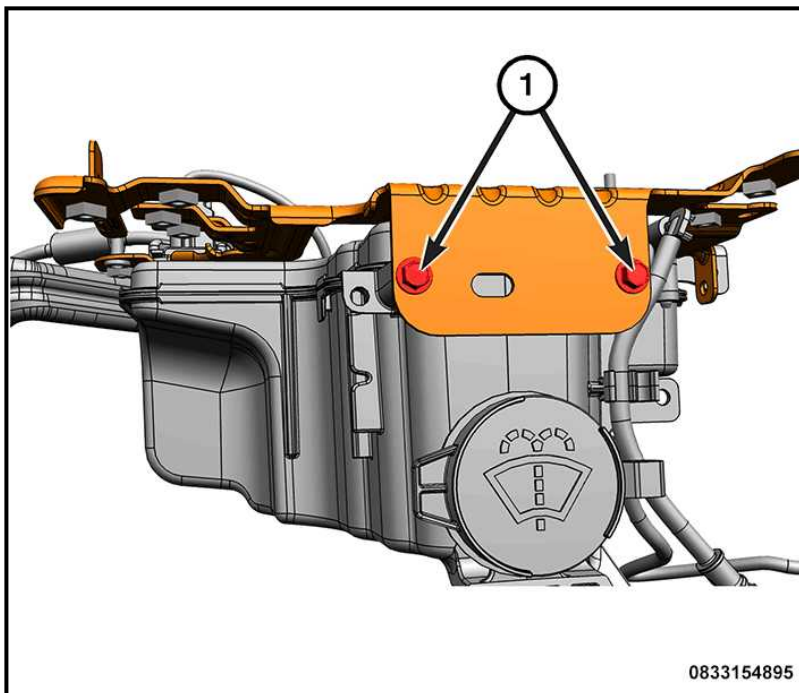
4. Remove the lower windshield washer reservoir mounting bolt (1).
5. Remove the connector and harness from the top of the Powertrain Control Module (PCM) bracket.
6. Remove the windshield washer hose from the windshield washer pump and drain the washer fluid into suitable container to reuse the fluid when done.



7. Remove the windshield washer reservoir bracket bolts (1) next to the Antilock Brake System (ABS).



8. Remove the windshield washer reservoir bolt (1) at the left fender.
9. Disconnect the washer pump hose and connections by the top of the windshield washer reservoir.
10. Pull up on the Powertrain Control Module (PCM) bracket with windshield washer reservoir and remove from the vehicle.



11. Remove the two bolts (1) at top of the brackets and remove windshield washer reservoir from the bracket.
12. Remove the washer pump from the reservoir. Refer to [**PUMP, WINDSHIELD WASHER, REMOVAL AND INSTALLATION.**](#)

INSTALLATION

1. Transfer the hoses to the new windshield washer reservoir.
2. Install the washer pump into the windshield washer reservoir. Refer to [**PUMP, WINDSHIELD WASHER, REMOVAL AND INSTALLATION.**](#)
3. Install the windshield washer reservoir on the Powertrain Control Module (PCM) bracket and install two upper bolts and securely tighten.
4. Install the windshield washer reservoir and Powertrain Control Module (PCM) bracket into vehicle.
5. Install the lower windshield washer reservoir bracket lower bolt and tighten to the proper. Refer to [**TORQUE SPECIFICATIONS .**](#)
6. Install the left front splash shield. Refer to [**SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .**](#)
7. Connect the washer pump and low level sensor connections and windshield washer pump hose.
8. Tighten two bolts for the windshield washer reservoir bracket by the Antilock Brake System (ABS) pump and tighten to the proper. Refer to [**TORQUE SPECIFICATIONS .**](#)
9. Tighten the upper washer reservoir bolt to the proper. Refer to [**TORQUE SPECIFICATIONS .**](#)
10. Install the connector at top of the Powertrain Control module (PCM) bracket.
11. Install the Powertrain Control Module (PCM). Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION .**](#)
12. Connect the negative battery cable(s). Refer to the appropriate service information .

SWITCH, MULTIFUNCTION, RIGHT

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - RIGHT MULTIFUNCTION SWITCH

The internal circuitry of the wiper (right) multifunction switch and the hardwired circuits between the switch and the Body Control Module (BCM) may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove

conclusive in the diagnosis of the BCM or the electronic controls and communication between modules and other devices that provide some features of the BCM-controlled wiper and washer system. The most reliable, efficient and accurate means to diagnose the BCM or the electronic controls and communication related to BCM-controlled wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

NOTE: The Steering Column Control Module (SCCM) for this vehicle includes the wiper (right) multifunction switch, the lighting (left) multifunction switch, the Steering Angle Sensor (SAS) and the clockspring. The two multifunction switches, SAS and the clockspring are inseparable from the SCCM and are serviced only as a unit. If any function or feature of either multifunction switch, SAS or the clockspring is ineffective or damaged, or if the Driver AirBag (DAB) has been deployed, the entire SCCM must be replaced. Refer to MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION .

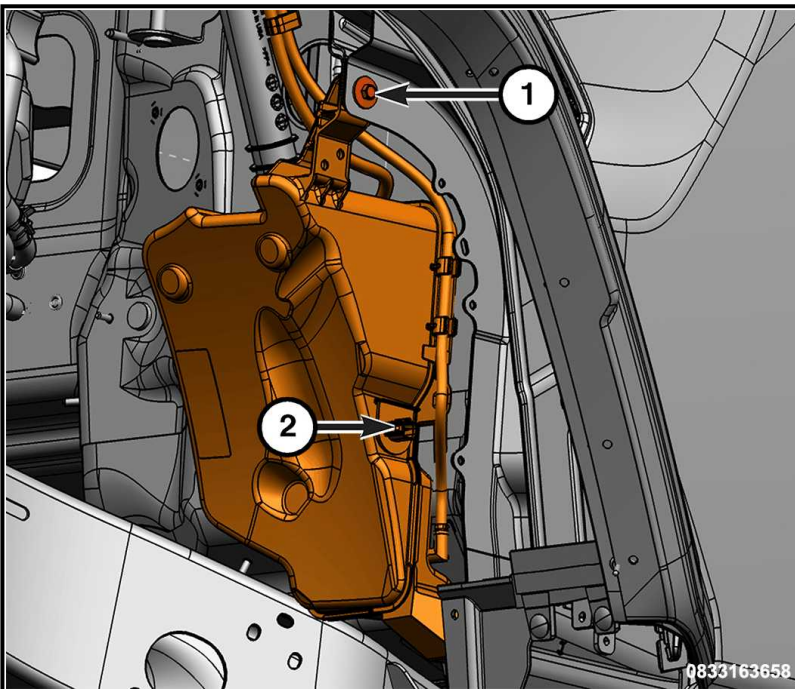
SWITCH, WASHER FLUID LEVEL

REMOVAL AND INSTALLATION

3.0L

REMOVAL

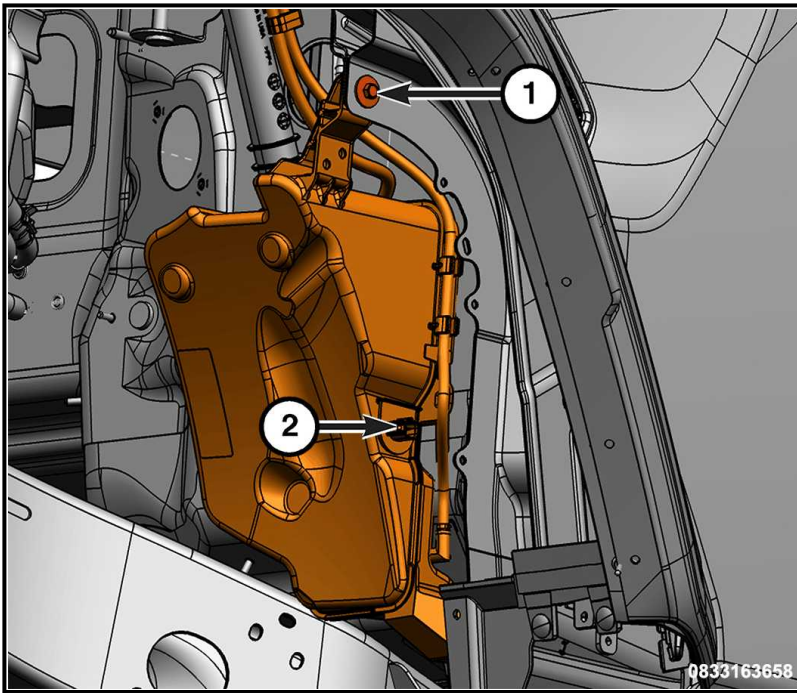
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the front wheel and splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .



3. Disconnect the washer fluid level switch (2) wire harness connector.
4. Using a trim stick or another suitable wide flat-bladed tool, gently pry the washer fluid level switch (2) from the rubber grommet seal in the washer reservoir. Care must be taken not to damage the washer reservoir.
5. Remove and **DISCARD** the rubber grommet seal from the switch mounting hole in the washer reservoir.

INSTALLATION

1. Install a **NEW** rubber grommet seal into the washer fluid level switch mounting hole.

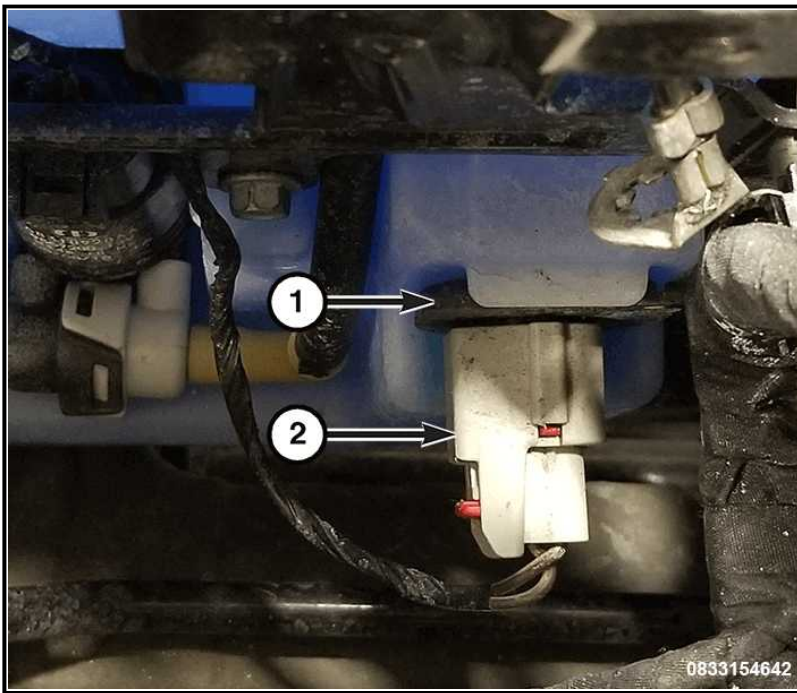


2. Install the washer fluid level switch (2) to the rubber grommet seal in the washer fluid reservoir. Using hand pressure, press firmly and evenly on the washer fluid level switch mounting flange until the barbed nipple is fully seated in the rubber grommet seal. The flat edge of the switch mounting flange should be pointed upward.
3. Connect the washer fluid level switch wire harness connector.
4. Install the front wheel and splash shield. Refer to [**SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION**](#) .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

3.6L

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the air cleaner resonator. Refer to [**RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION**](#) .
3. Remove the Powertrain Control Module (PCM) and the mounting bracket. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .



4. Disconnect the washer fluid level switch wire harness connector (2).
5. Using a trim stick or another suitable wide flat-bladed tool, gently pry the washer fluid level switch (1) from the rubber grommet seal in the washer reservoir. Care must be taken not to damage the washer reservoir.
6. Remove and **DISCARD** the rubber grommet seal from the switch mounting hole in the washer reservoir.

INSTALLATION

1. Install a **NEW** rubber grommet seal into the washer fluid level switch mounting hole.
 2. Install the washer fluid level switch to the rubber grommet seal in the washer fluid reservoir. Using hand pressure, press firmly and evenly on the washer fluid level switch mounting flange until the barbed nipple is fully seated in the rubber grommet seal. The flat edge of the switch mounting flange should be pointed upward.
 3. Connect the washer fluid level switch wire harness connector.
 4. Install the PCM and the mounting bracket. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
 5. Install the air cleaner resonator. Refer to [**RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION**](#) .
 6. Connect the negative battery cable(s). Refer to the appropriate service information .
-

2021 ACCESSORIES AND EQUIPMENT

(Automatic Sway Bar System (ASBS) - Electrical Diagnostics) - Gladiator

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
C008E-00	ECU INTERNAL PERFORMANCE
C2129-16	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
C2129-17	BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
C212A-16	SYSTEM VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
C212A-17	SYSTEM VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
U0002-00	CAN C BUS OFF PERFORMANCE
U0102-00	LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD
U0121-00	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0403-00	IMPLAUSIBLE DATA RECEIVED FROM TCASE
U0415-00	IMPLAUSIBLE DATA RECEIVED FROM ABS
U0422-00	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

DIAGNOSIS AND TESTING

C008E-00-ECU INTERNAL PERFORMANCE

For a complete AUTOMATIC SWAY BAR wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No under voltage DTCs set.

SET CONDITION

- Automatic Sway Bar System (ASBS) Module detected an internal fault.

DEFAULT ACTION

- Off-Road suspension mode will be unavailable.

POSSIBLE CAUSES

Possible Causes
ASBS MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Automatic Sway Bar System (ASBS) Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ASBS Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ASBS Module DTCs.

Did the DTC return?

Yes

- Replace the ASBS Module in accordance with the Service information. Refer to [MODULE, ACTIVE SWAY BAR SYSTEM \(ASBS\), REMOVAL AND INSTALLATION](#) .
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

C2129-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete AUTOMATIC SWAY BAR wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on.

SET CONDITION

- The Automatic Sway Bar System (ASBS) Module detects that the Electronic Control Unit (ECU) B(+) input voltage less than 9.0 volts for 15 seconds or longer.

DEFAULT ACTION

- Off-Road suspension mode will be unavailable.

POSSIBLE CAUSES

Possible Causes
RELATED CHARGING SYSTEM DTCS PRESENT IN BODY CONTROL MODULE (BCM) OR POWERTRAIN CONTROL MODULE (PCM)
FUSED B(+) CIRCUIT SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ASBS MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND POWERTRAIN CONTROL MODULE (PCM)

1. With the scan tool, check the BCM and PCM for Battery and Charging System DTCs.

Are any Battery or Charging System DTCs set?

Yes

- Perform PCM DTC diagnostic procedure(s) or BCM DTC diagnostic procedures. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) , and Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE (A959) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE (A959) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the applicable ECU harness connector.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

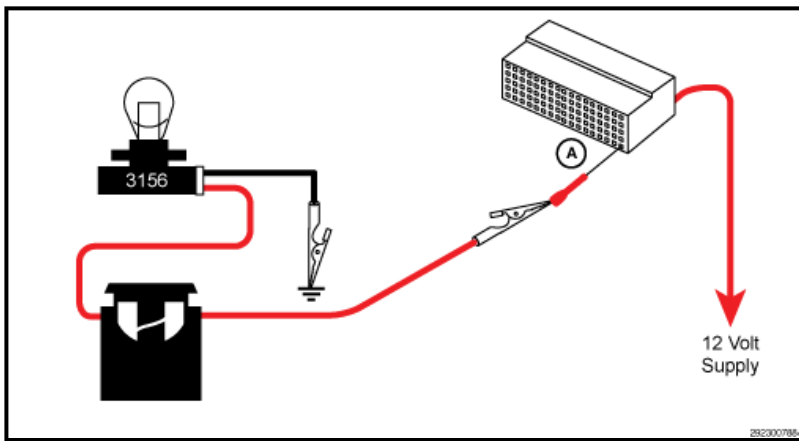
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** procedure in **CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

5. CHECK THE (Z906) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A GROUND CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

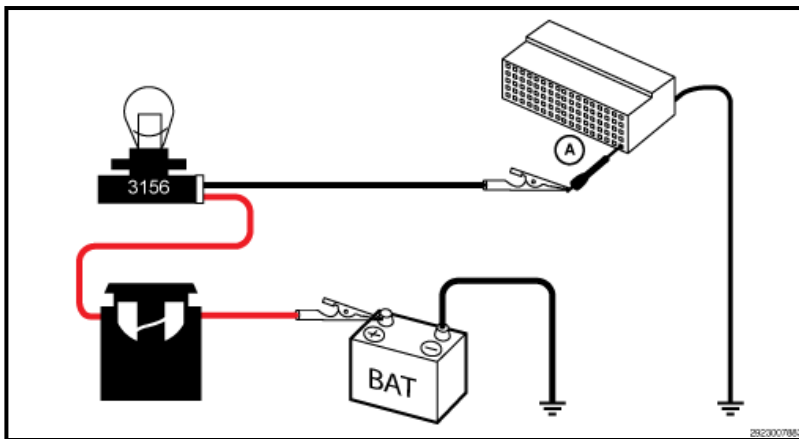
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **LOAD TESTING A GROUND CIRCUIT** procedure for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

**NOTE:**

When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all ASBS Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ASBS Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ASBS Module DTCs.

Did the DTC return?

Yes

- Replace the ASBS Module in accordance with the Service information. Refer to [MODULE, ACTIVE SWAY BAR SYSTEM \(ASBS\), REMOVAL AND INSTALLATION](#).
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

C2129-17-BATTERY VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete AUTOMATIC SWAY BAR wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on.

SET CONDITION

- The Automatic Sway Bar System (ASBS) Module detects that the Electronic Control Unit (ECU) B+ input voltage is greater than 16.0 volts for 15 seconds or longer.

DEFAULT ACTION

- Off-Road suspension mode will be unavailable.

POSSIBLE CAUSES

Possible Causes
RELATED CHARGING SYSTEM DTCS PRESENT IN BODY CONTROL MODULE (BCM) OR POWERTRAIN CONTROL MODULE (PCM) ASBS MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCS.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND POWERTRAIN CONTROL MODULE (PCM)

1. With the scan tool, check the BCM and PCM for Battery and Charging System DTCS.

Are any Battery or Charging System DTCS set?

Yes

- Perform PCM DTC diagnostic procedure(s) or BCM DTC diagnostic procedures. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** , and Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all Automatic Sway Bar System (ASBS) Module harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all ASBS Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read ASBS Module DTCs.

Did the DTC return?

Yes

- Replace the ASBS Module in accordance with the Service information. Refer to [MODULE, ACTIVE SWAY BAR SYSTEM \(ASBS\), REMOVAL AND INSTALLATION](#) .
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the ASBS VERIFICATION TEST. Refer to [ASBS VERIFICATION TEST](#).

C212A-16-SYSTEM VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete AUTOMATIC SWAY BAR wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on.

SET CONDITION

- The Automatic Sway Bar System (ASBS) Module receives a Controller Area Network (CAN) message from the Body Control Module (BCM) that the vehicle system voltage is less than 10.0 volts for 15 seconds or more.

DEFAULT ACTION

- Off-Road suspension mode will be unavailable.

POSSIBLE CAUSES

Possible Causes
RELATED DTCS ARE SET IN THE BCM OR POWERTRAIN CONTROL MODULE (PCM) BATTERY OR CHARGING SYSTEM FAULT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. LOW VOLTAGE MESSAGE RECEIVED FROM CONTROLLER AREA NETWORK (CAN) BUS

NOTE: This DTC indicates that a message was received over the CAN bus indicating the vehicle system voltage is too low.

1. Refer to the recorded DTCs.

Are any battery or charging system related DTCs set in the Body Control Module (BCM) or Powertrain Control Module (PCM)?

Yes

- Perform PCM DTC diagnostic procedure(s) or BCM diagnostic procedures. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** , and Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Perform the BATTERY SYSTEM DIAGNOSIS AND TESTING and CHARGING SYSTEM DIAGNOSIS AND TESTING procedures. Refer to [DIAGNOSIS AND TESTING](#) , or [DIAGNOSIS AND TESTING](#) . . Refer to [DIAGNOSIS AND TESTING](#) , or [DIAGNOSIS AND TESTING](#) .

C212A-17-SYSTEM VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete AUTOMATIC SWAY BAR wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on for more than 5 seconds.

SET CONDITION

- The Automatic Sway Bar System (ASBS) Module receives a Controller Area Network (CAN) message from the Body Control Module (BCM) that the vehicle system voltage is greater than 16.0 volts for 15 seconds or more.

DEFAULT ACTION

- Off-Road suspension mode will be unavailable.

POSSIBLE CAUSES

Possible Causes
RELATED DTCS ARE SET IN THE BCM OR POWERTRAIN CONTROL MODULE (PCM) BATTERY OR CHARGING SYSTEM FAULT

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. HIGH VOLTAGE MESSAGE RECEIVED FROM CONTROLLER AREA NETWORK (CAN) BUS

NOTE: This DTC indicates that a message was received over the CAN bus indicating the vehicle system voltage is too high.

1. Refer to the recorded DTCs.

Are any battery or charging system related DTCs set in the Powertrain Control Module (PCM)?

Yes

- Perform PCM DTC diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) , or [3.6L \(GPEC 2A\) - DIAGNOSTIC CODE INDEX](#) .

No

- Perform the BATTERY SYSTEM DIAGNOSIS AND TESTING and CHARGING SYSTEM DIAGNOSIS AND TESTING procedures. Refer to [DIAGNOSIS AND TESTING](#) , or [DIAGNOSIS AND TESTING](#) . . Refer to [DIAGNOSIS AND TESTING](#) , or [DIAGNOSIS AND TESTING](#) .

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to [BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX](#) .

U0102-00-LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0403-00-IMPLAUSIBLE DATA RECEIVED FROM TCASE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0415-00-IMPLAUSIBLE DATA RECEIVED FROM ABS

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

STANDARD PROCEDURE

ASBS VERIFICATION TEST

DIAGNOSTIC TEST

PERFORM ASBS VERIFICATION TEST

CAUTION: Before removing the ASBS harness connector, clean the connector and locking cam area of dirt and debris. Failure to do so can result in the connector being jammed or damage to the locking cams on the harness connector or module. Do not force the assist arm when releasing or installing the harness connector.

NOTE: If any control modules were replaced, refer to the service information for proper programming procedures.

NOTE: When a Stabilizer System DTC diagnostic is complete and all repairs have been made, running the Stabilizer Motor System Test and/or LED System Test can also provide verification that the DTC has been repaired and the system is operating normally.

1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
2. Ensure that all accessories are turned off.
3. Ensure that the battery is fully charged.
4. With the scan tool, record and erase all DTC(s) from the ASBS
5. Start and run the engine for 2 minutes while operating all functions of the system that caused the original concern.
6. Turn the ignition off, wait 5 seconds, then turn the ignition on. Using the scan tool, read DTC(s) from the ASBS.

Are any ASBS DTC(s) present or is the original condition still present?

Yes

- The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No

- The repair is complete.
-

